A CLINICAL STUDY OF POSTOPERATIVE COMPLICATIONS FOLLOWING REPAIR OF VENTRAL HERNIA USING MESH AMONG PATIENTS ADMITTED IN COIMBATORE MEDICAL COLLEGE HOSPITAL

Dissertation submitted in partial fulfillment of the regulation for the award of

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(BRANCH I)

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CERTIFICATE

This is to certify that the dissertation titled **"A CLINICAL STUDY OF POSTOPERATIVE COMPLICATIONS FOLLOWING REPAIR OF VENTRAL HERNIA USING MESH AMONG PATIENTS ADMITTED IN COIMBATORE MEDICAL COLLEGE HOSPITAL"** is a bonafide research work done by **DR.CHANDANA CHANDRAN** and submitted in partial fulfillment of the requirements for the Degree of **M.S, GENERAL SURGERY, BRANCH I** of the **TAMILNADU DR. M.G.R MEDICAL UNIVERSITY, CHENNAI.**

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DECLARATION

I solemnly declare that the dissertation titled **"A CLINICAL STUDY OF POSTOPERATIVE COMPLICATIONS FOLLOWING REPAIR OF VENTRAL HERNIA USING MESH AMONG PATIENTS ADMITTED IN COIMBATORE MEDICAL COLLEGE HOSPITAL"** was done by me from 2009 – 2012 under the guidance and supervision of **PROF. Dr. S.NATARAJAN M.S.** This dissertation is submitted to the **TAMILNADU DR. M.G.R MEDICAL UNIVERSITY** towards the partial fulfillment of the requirement of award of **M.S DEGREE IN GENERAL SURGERY (BRANCH I).**

Place: **Dr. CHANDANA CHANDRAN**

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CONTENTS

LIST OF TABLES

LIST OF CHARTS

LIST OF PHOTOGRAGHS

INTRODUCTION

Hernia is derived from the Greek word ‘ Hernios’ meaning an offshoot, a budding or bulge. The Latin word hernia means a rupture or tear [1].

VENTRAL HERNIA: It is a collective term of all extrusions of peritoneum and abdominal contents through the anterolateral abdominal wall excluding groin hernias. It can be spontaneous or acquired. This includes

1. Incisional / postoperative hernias: It is the result of failure of the lines of closure of the abdominal wall following laparotomy. The approximated tissues separate and the abdominal organs, mainly bowel bulge through the gap which is covered from inside outwards with peritoneum, scar tissue and skin. These are the most common type of hernias next to groin hernias.
2. Umbilical hernias: Umbilical scar in infants does not close completely or if it fails and stretches in later years, the abdominal contents protrude through the opening and constitute an umbilical hernia.
3. Paraumbilical hernias: Midline hernias abutting on the umbilicus superiorly and inferiorly are called paraumbilical hernias.
4. Epigastric hernia: They are protrusions of abdominal contents through the interstices between the deccusating fibres of the sheet muscles of the abdominal wall in the midline (linea alba), between the xiphoid process and the umbilicus.
5. Spigelian hernia: Protrusion through spigelian fascia of anterior abdominal wall. Occurs between umbilicus and arcuate line.

Out of these ventral hernias incisional hernia is the most common. Then comes umbilical, paraumbilical and epigastric hernias. Spigelian hernias are very rare.

Patients may be unaware of the presence of small ventral hernias. But it may attain such dimensions as to form a second abdomen outside of the natural abdominal boundaries forcing the patient to seek medical advice either because of deformity discomfort or cosmetic problems.

The complications of ventral hernia are less but still it is dangerous. The hernia can go for obstruction, strangulation, incarceration or can cause skin necrosis and perforation. All of these can markedly increase the risk of patient's life. Hence it is important to perform the type of operation which will offer best chance of permanent cure with minimal risk. The ideal treatment is surgery. Various methods of repair have evolved from time to time for this challenging disease. The anatomical repairs used earlier was associated with many postoperative complications especially recurrence. Then came the use of non absorbable synthetic mesh prosthesis which has revolutionized the ventral hernia especially incisional hernia repair.

The use of Synthetic plastic material like PROLENE MESH, MARLEX MESH[40], MERSELINE (DACRON) MESH has changed the surgical treatment of the ventral (incisional) hernia. The recurrence of the hernia rate has been reduced from 39% to 11%. But even this procedure is associated with post operative complications.

In this clinical study post-operative complications following repair of ventral hernia using mesh has been considered. Some emphasis has been laid on the etiological factors leading to the occurrence of incisional hernias. In this study, the short term complications following repair of ventral hernia using mesh done in our hospital during 2009 –2010 were studied and the results were compared to the literature standards. In earlier studies from literature have shown that post operative complications are responsible for recurrence of the hernia. This study helps to identify

the complications, the risk factors associated with the development of these complications. Thus it will help to identify the post operative complications at an earlier stage there by reducing the morbidity i.e recurrence of hernia.

AIM OF THE STUDY

The main aim of the study is:

1. To study the short-term post operative complications following repair of ventral hernia using mesh.
2. To identify the risk factor for the complications.

Along with this study history and etiology of ventral hernia, age and sex incidence, clinical presentation, risk factors, pre operative preparations and post operative care will be discussed. This study also helps to find out the risk factors in previous surgery responsible for development of incisional hernia.

REVIEW OF LITERATURE

HISTORICAL ASPECTS: Hernia is as ancient as man himself. The manifestation of hernia are readily seen and felt and therefore it was probably one of the first diseases to be recognized. Even in the primitive societies the people soon learned to return the protruding organs to the abdomen by manual pressure, to support the area with the hand during coughing or straining. Later, when they had learned how to treat wounds and immobilize fracture, they could also apply bandages and crude trusses[1].

Hernia is an old malady and the word is derived from the Greek "Hernios" meaning a branch or offshoot and this is descriptive of the swelling that the lesion produces[1].

Modern medicine derived from the Hippocratic writings in the 4th and 5th century B.C. strangely has not mentioned hernia. A Roman "Celsus" who dealt very extensively with hernia was the most important figure in the long history of this subject for more than a millennium. He described other types of hernia also, including Ventral and Umbilical hernia and their repair.

Pierre Franco (1500-1561) the great figure of French Renaissance Surgery – has worked for hernia care and brought out his book ' TRACT DES HERNIAS' in 1556[4].

Pierre dionns of France coined the word enterocoele derived from enterose – meaning intestine and kele means – descends – so descent or falling of the intestine which are called hernia.

Guy de Chauliae in his Chirurgica magna 1585 differentiated umbilical hernia from those occurring in other parts of the abdominal wall[4].

Lachausse likewise made this differentiation in his Dissertation 'de herniae Ventralis'.

In 18th century, there were major advances in surgery and the pathology and treatment of hernia became a subject for specialised study.

In the beginning of 19th century that attention was specifically directed to these hernias, abdominal operations were common and incisional hernia development, through the scars were more. In the middle of 19th century – two major obstacles to the advance of surgery were overcome by means of the discovery of anaesthesia by American doctors 1842–1846 and the development of asepsis by Lister in England, more abdominal surgeries came in.

The history of ventral hernia repair began with Gerdy recorded having repaired an incisional hernia as early as 1836[3]. In 1890 Sangers made first attempt at a purely fascial plastic operation for ventral herniae. In 1899 William J. Mayo advocated an overlapping fascial plastic operation from downwards. It was mainly designed to cure umbilical hernia, but proved equally effective in the post operative ventral hernia[2].

Repair of incisional hernia is one of the few instances in surgery in which implants and foreign material were used to bridge gaps before the natural tissue. Witzel in 1900, Gospel also in 1900, Barlett[10] in 1903, McGavin[7] in 1909 advocated use of silver wire filigree. Koontz[26] and Throckmorton[30] each in 1948 used tantalum gauze. Sheets of stainless wire and tantalum were also used. These metals fragmented within short time, Furthermore fragments of metal cause skin sinuses and even perforation of bowel and hence were given up[1].

Darn techniques of repair of post operative hernia were introduced early in the 18th century. A variety of sutures including strips of fascia lata or silk or even animal

tendon were used. In 1949 Gosset revived the use of full thickness strips of auto graft skin in the form of a reinforcing darn repair. In 1948 Abel reported his initial experiences with closing the abdominal incisions and repairing hernias with monofilament stainless steel wire[36,37]. Hunter reported his experience of using monofilament nylon suture and closing only the anterior rectus sheath layer. Then Maingot modified this nylon darn technique and developed his shoe lace method for the repair of ventral post operative hernias.

The modern era of prosthetic hernia repair began in 1958 when Usher reported his experience with polyamide mesh[8]. Later, braided polyster mesh, polypropelene mesh and expanded polytetrefluoroethylene (PTFE) were introduced. These three materials have revolutionizes the surgery for post operative hernia so that historic methods should now be abandoned.

SURGICAL ANATOMY OF ANTERIOR ABDOMINAL WALL

The abdominal wall is a complex musculoaponeurotic structure that is attached to the vertebral column posteriorly, the ribs superiorly, and the bones of the pelvis inferiorly. The abdominal wall protects and restrains the abdominal viscera, and its musculature acts indirectly to flex and vertebral column. The integrity of the abdominal wall is essential to the prevention of hernias, whether congenital, acquired, or iatrogenic[1].

The abdominal wall can be conveniently divided into -

1. Antero-lateral wall and
2. Posterior wall.

Only anatomy of the antero-lateral wall will be considered here in detail.

The antero-lateral abdominal wall is composed of seven layers. From without inwards, they are -

1. Skin
2. Tela subcutanea (subcutaneous tissue)[6].
3. Superficial fascia (Scarpa's fascia).
4. Muscles and their aponeurosis.
5. Endoabdominal (transversalis) fascia.
6. Pro-Peritoneal areolar tissue.
7. Peritoneum.

MUSCLES AND THEIR APONUEROSIS

Muscles of antero-lateral abdominal wall consists of four large muscles and two small muscles. Flat muscles are

1. External oblique abdominis.
2. Internal oblique abdominis.
3. Transversus abdominis and
4. Rectus abdominis.

Small muscles are

1. Pyramidalis and
2. Cremastric.

EXTERNAL OBLIQUE ABDOMINIS MUSCLE

Of all the muscles of the anterior abdominal wall, this is the most superficial and the broadest muscle. This muscle arises by a series of slips from the lower 6 ribs. The upper slips interdigitate with the slices of the serratus anterior, while the lower 4 slips interdigitate with that of lattismus dorsi. All these slips blend together to form a

single broad muscle and its fibres run vertically downwards and are inserted into the anterior 2/3 of outer lip of iliac crest. The remaining fibres become aponeurotic near the linea semilunaris and pass infront of rectus abdominis to reach the xiphoid processs linea alba and pubic symphysis. No muscle fibre are normally found below the spinoumbilical line. The lower border of the aponeurosis is reflected between the anterior superior iliac spine and pubic tubercle to for the inguinal ligament.

Nerve supply:- Anterior primay rami of lower six thoracic nerves.

INTERNAL OBLIQUE ABDOMINIS MUSCLE

Lying under cover of the external oblique, it arises from the thoracolumbar fascia the iliac crest and the lateral 2/3 of the inguinal ligament. The fibres run upwards and medially and inserted into the lower three ribs, xiphoid process and linea alba. The lower most fibres form the cremastric muscle and continued down over the spermatic cord, while the fibres passing immediately above the cord contributes to form the conjoint tendon.

Nerve supply:- Anterior primary rami of lower six thoracic and first lumbar nerve.

TRANSVERSUS ABDOMINIS MUSCLE

Third and the deepest of the anterolateral muscles arises from the cartilages of the lower six ribs, by an aponeurosis from the dorsolumbar fascia, by a fleshy origin from the inner lip of iliac crest and the most lateral part of the inguinal ligament. In most of the part, the fibre bundles run almost transversely towards the linea alba but the lower most fibres are inclined some what medially towards the pubis.

Nerve supply:- Anterior rami of lower six thoracic and first lumbar nerve.

RECTUS ABDOMINIS MUSCLE AND RECTUS SHEATH

The recti abdomini are long, broad muscles lying longitudinally in the medial aspect of the abdominal wall. Each arises from the front of the symphysis and the pubic crest, and inserts into the xiphoid and the cartilages of the fifth to seventh ribs. Each is enclosed in a sheath. Three to five tendinous intersections cross the rectus muscle. They are attached to the anterior portion of the rectus sheath and hence serve to prevent the retraction of the muscle in transverse incision.

Each rectus muscle contained within a fascial sheath, the rectus sheath, which is derived from the aponeurosis of the three flat abdominal muscles. The relationship of the aponeurosis of the flat muscles is not constant throughout the course of the rectus muscle. The relationship is different above and below the semicircular line of Douglas, which is about halfway between the umbilicus and pubic symphysis. Above the semicircular line, the rectus sheath is strong posteriorly. Here the posterior sheath is composed of fascia from the internal oblique muscle, the transversus abdominis muscle, and transversalis fascia. Anteriorly, above the semicircular line the rectus sheath is composed of the external oblique aponeurosis and the anterior lamella of the internal oblique aponeurosis.

Below semicircular line, which is the point at which the inferior epigastric artery enters the rectus sheath, the posterior rectus sheath is lacking because the fascia of the flat muscles pass anterior to the rectus muscle. The muscle below the semicircular line, is covered posteriorly by a thin layer of transversalis fascia.

The recti muscles are held close together near the anterior midline by the linea alba. The linea alba is so called, because it is a white line. The linea alba itself has an elongated triangular shape, and is based at the xiphoid process of the sternum. The

linea alba narrows considerably below the umbilicus, so that the medial edge of one rectus muscle may actually overlap the other.

Nerve Supply:- The Rectus abdominis is supplied by the ventral rami of lower 6 or 7 thoracic spinal nerves.

PYRAMIDALIS MUSCLE

The pyramidalis is a small triangular muscle superficial to the rectus muscle arising from the front of the pubis, and inserting into the linea alba approximately half way between the symphysis and the umbilicus.

Nerve supply is subcostal nerve, which is the ventral ramus of the twelfth thoracic spinal nerve.

TRANSVERSALIS FASCIA

It is an extensive connective tissue layer which lines the entire abdominal cavity, so strictly speaking it should properly be called the endoabdominal fascia. It lies just superficial to the peritoneum. Superiorly it continues with the fascia on the inferior surface of the diaphragm. Posteriorly it covers the psoas and quadratus lumborum. In the pelvis it covers the levator ani muscle.

The integrity of the transversalis fascia is absolutely essential for the integrity of the abdominal wall. If this layer is intact no hernia exists. A hernia may, in fact, be defined as a hole in the endoabdominal fascia or transversalis fascia. This definition applies to oesophageal hiatus hernia, umbilical hernia, inguinal hernia, femoral hernia, and incisional hernia.

ARTERIAL SUPPLY

The arterial supply of abdominal wall is developed embryologically is independent of the visceral organs and has a distinctly different system of blood supply. The main sources of arterial supply are from the following.

1. The internal mammary artery through the upper rectus abdominis muscle to the upper central abdominal structures.
2. The segmental thoracic and lumbar intercostals arteries from the side between the external and internal oblique muscles with direct lateral skin perforators.
3. The external iliac artery giving off the deep inferior epigastric artery to the lower rectus abdominis muscle and skin and the deep circumflex iliac artery supplying the inner aspects of the ilium and terminating in the skin over the iliac crest.
4. The femoral artery giving off the superficial inferior epigastric artery to the lower abdomen and the superficial circumflex iliac artery to the anterior iliac spine area.

VENOUS DRAINAGE

Venous drainage of the abdomen parallels that of the arteries. The superficial veins that drain the upper abdomen are the superior epigastric, the intercostals and the axillary veins. The lower abdomen is drained by the superficial inferior epigastric, the superficial circumflex iliac and the deep inferior epigastric veins. Enlarged veins are seen occasionally around the umbilicus and are called the “caput medusae”. The similar network of collateralization occurs between veins as in the arteries. Valves however do exist both in the superficial and deep systems, but retrograde flow against the valves can occur to some degree.

LYMPHATIC DRAINAGE

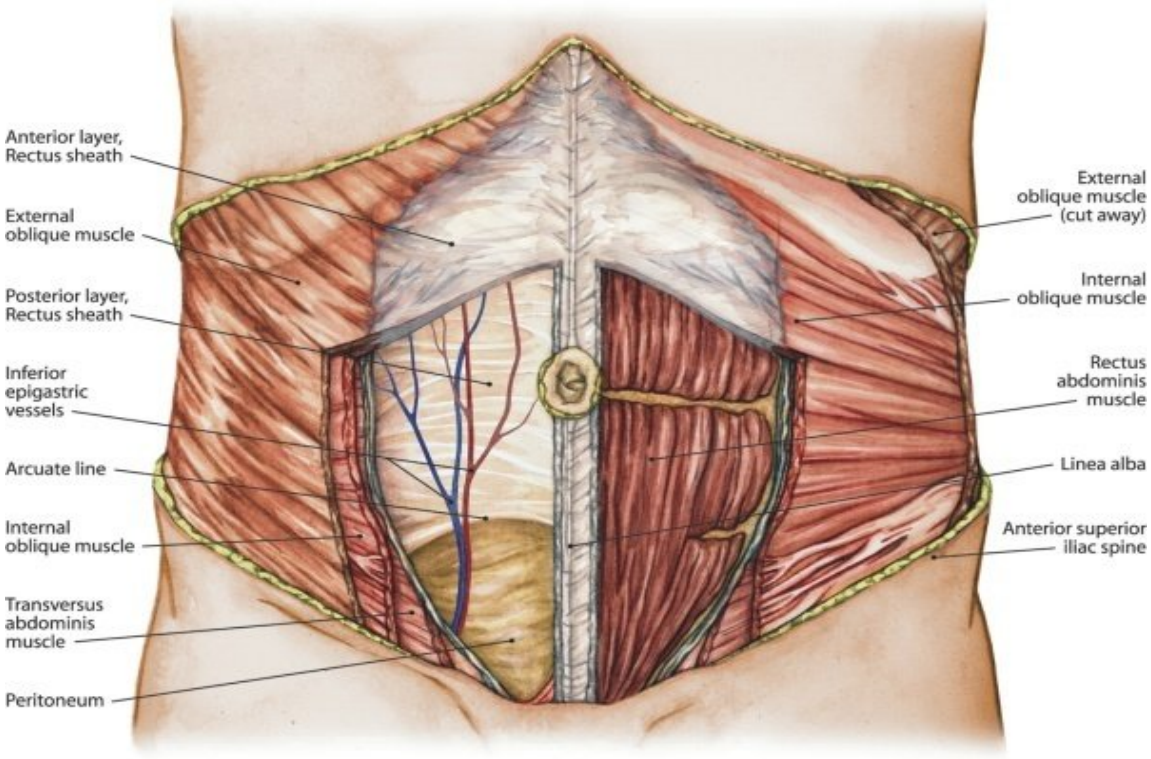
The lymphatic drainage of the abdominal wall follows a single pattern. Above the umbilicus, the superficial lymphatic pathways drain into the ipsilateral axillary lymph nodes. Below the umbilicus, they drain into the ipsilateral superficial inguinal lymph nodes. Above the umbilicus, the deep lymphatics drain upwards into the internal mammary lymph nodes. Below the umbilicus, they drain into the deep iliac nodes. Lymph vessels from the liver course along ligamentum teres and communicate with superficial lymphatics of anterior abdominal wall.

NERVE SUPPLY

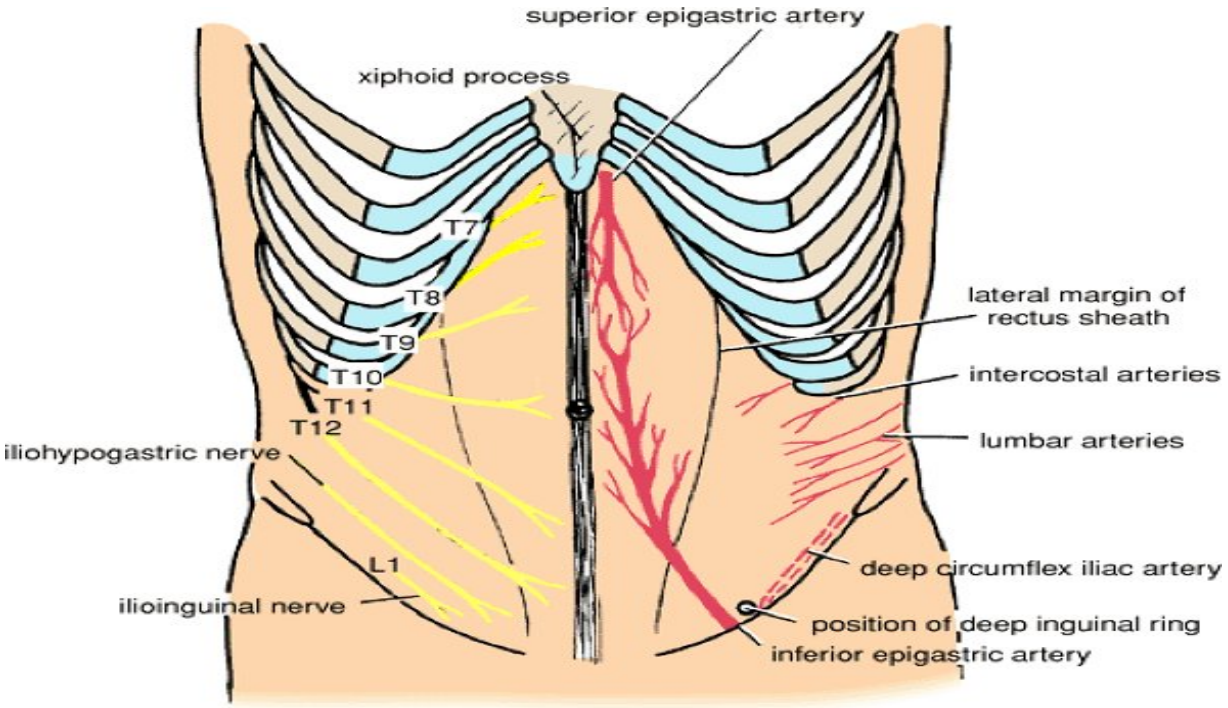
The cutaneous nerve supply of the abdominal wall is predominantly from the 6^{th} to 12^{th} thoracic nerves, which pass into the subcutaneous layer laterally at the midaxillary lines and anteriorly near the midline. The iliohypogastric and ilio inguinal nerves supply the inferolateral aspect of the abdomen. The intercostals nerves are both motor and sensory.

Undermining of the skin for abdominoplasty or skin flaps may result in areas of hyper aesthesia, loss of muscle innervation may be observed in areas of abdominal wall weakness and bulging.

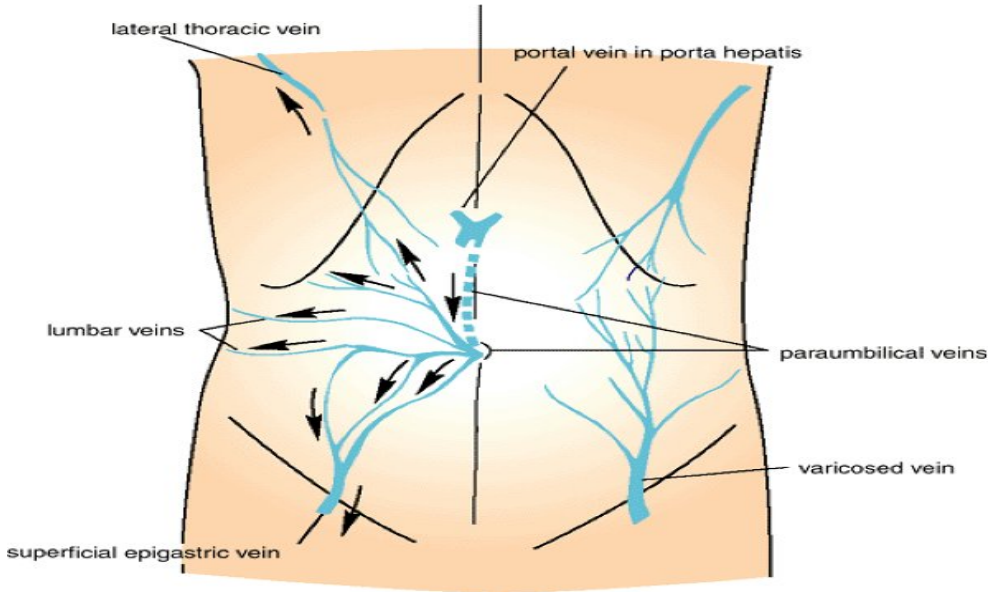
LAYERS OF ANTERIOR ABDOMINAL WALL



SEGMENTAL INNERVATION AND ARTERIAL SUPPLY OF ANTERIOR ABDOMINAL WALL

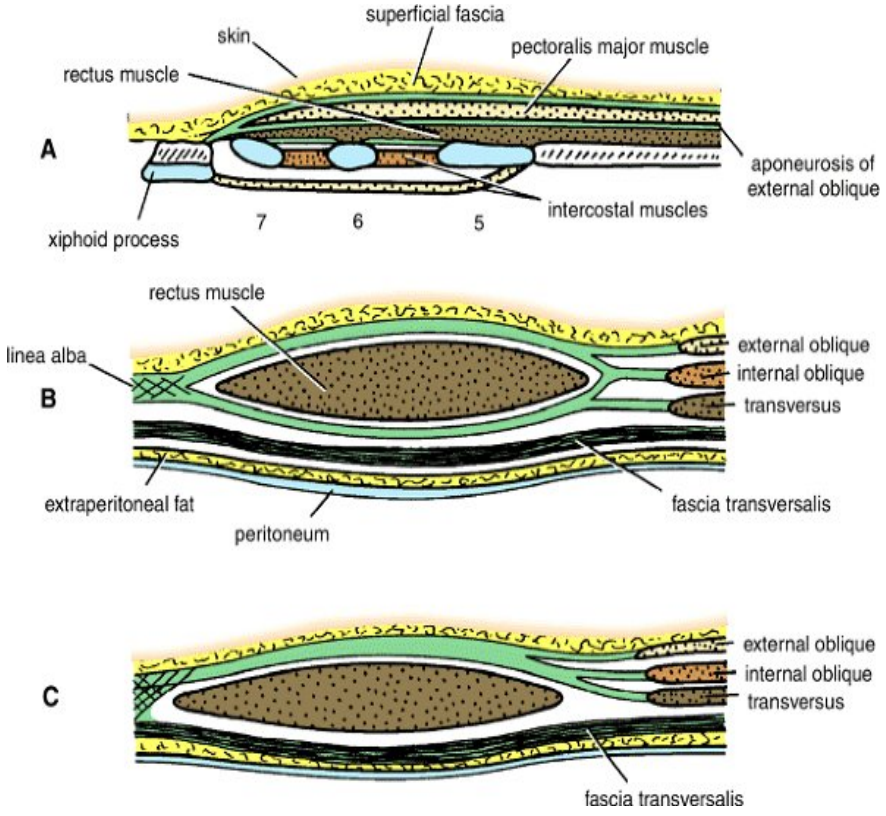


VENOUS DRAINAGE OF ANTERIOR ABDOMINAL WALL



Superficial veins of the anterior abdominal wall. On the left are anastomoses between systemic veins and the portal vein via paraumbilical veins.

RECTUS SHEATH



Transverse sections of the rectus sheath seen at three levels. A. Above the costal margin. B. Between the costal margin and the level of the anterior superior iliac spine. C. Below the level of the anterior superior iliac spine and above the pubis.

ABDOMINAL INCISIONS AND CLOSURES

INCISIONS

The choice of incision and correct methods of making and closing such wounds are factors of great importance. Any mistake, such as a badly placed incision, incorrect methods of suturing or ill judged selection of suture materials, may result in serious complications such as haematoma formation, infection, stitch abscess, an ugly scar, an incisional hernia, or worst of all, complete disruption of the wound. Therefore, to prevent such complications certain essentials should be achieved. (Harold Ellis)[1] .

1. Accessibility:

The incision must give ready and direct access to the anatomy to be investigated and must also provide sufficient room for the required procedure to be performed.

2. Extensibility:

The incision should be extensible in a direction that will allow for any probable enlargement of the scope of the operation, but it should interfere as little as possible within the functions of the abdominal wall.

3. Security:

The closure of the wound must be reliable and ideally should leave the abdominal wall as strong after the operation as before.

4. Incisions placed against the lines of tension are prone to post-operative complications of dehiscence or hypertrophic scars. Sutures hold best when and where they pull across tissue fibers. This can be accomplished only by making the incision, so that it runs parallel to the tissue fibers. The muscles must be split in the direction of their fibers rather than cut across.

5. The incision must traverse muscle rather than fascia as the scar left in the peritoneum is best protected.

6. Incisions placed across the blood and nerve supply, are prone to post-operative complications of dehiscence.

7. Parallel incisions of T-incisions are generally undesirable because of compromise in circulation and denervation of muscles.

8. The rectus muscle may be cut transversely without seriously weakening the abdominal wall as such a cut passes between two adjacent nerves without injuring them. The rectus has a segmental nerve supply so that there is no risk of a transverse incision cutting off the distal part of the muscle from its nerve supply.

9. The opening made by the out through the different layers of the abdominal wall must as far as possible not to be superimposed.

10. Reentry into the abdomen should preferably be performed through the previous incision, as there is a distinct risk that a second incision placed alongside the previous wound, would cut off the blood supply of the skin between the two incisions, resulting in necrosis of the skin bridge. Also denervated muscle may not hold sutures well.

11. In children, the skin incision should conform to Langerhans lines,

otherwise the scar becomes hypertrophic and unsightly with age.

CLOSURE

Ideal method of closure of abdominal incisions, is as important as making an incision.

The principles governing abdominal closures are.

1. Non-absorbable suture materials should preferably be used to suture the fascial layers, because of the increased intraabdominal pressure, and the fact that the scar is not sufficiently strong until 8 weeks or more later (Robert J. backer).
2. When fascia is being closed, a double strand of smaller suture material is stronger, grasp a wider bite of fascia and therefore approximate fascia more securely than does a single strand of heavier suture material. For example, it is preferable to use doubled '00' polypropylene, than a single strand of 0 material (Robert J. Baker)
3. The sutures should not be tightened too tightly to avoid interruption of the circulation resulting areas of focal necrosis.
4. For closure of the fascial edges, wide bites must be taken a minimum of 1 cm from the wound edge, and placed at 1 cm or less intervals[27].
5. Drains and colostomy stomas should invariably be brought out through a separate stab wound. In order to prevent weakening of the main laparotomy incision
6. When tension on the wound is anticipated, deep tension sutures can be used, and if they have been employed, they are left in situ for 14 days.

AETIOPATHOLOGY OF INCISIONAL HERNIA

Many factors, singly or in combination, may cause failure of the wound to heal satisfactorily and lead to the development of incisional hernia.

PRE OPERATIVE CAUSES

1) AGE

Certainly incisional hernia is not unique to elderly patients, but wound healing is somewhat impaired in patients older than 60 yrs of age and incidence in comparable situation is considerably increased with tissue senescene (Kozoll, 1964; Thorakson, 1965 and Lindner, 1975). Blomstedt and Bucknell (quoted by G. M. Larson et al, 1984) both noted an increase of hernia in patients over age 60[9].

2) OBESITY

Obesity was associated with three fold increase in herniation in Bucknell study[9]. Obesity is one of the factors that is more or less controllable in elective procedures as well as in hernial repair. The risk of herniation posed by obesity depends on the increased hazard of wound sepsis with a heavy panniculus, as well as the increased intra abdominal pressure that accompanied as markedly thickened omentum and mesentery. Hence obese patients should be stimulated by all available means to lose weight before an elective operation. In the wound closure in obese patients meticulous hemostasis is essential to avoid development of a postoperative wound hematoma, which is apt to become infected. Closed suction drainage should be used whenever necessary.

3) GENERAL DEBILITY

General debility consequent on one of numerous chronic wasting diseases, influences the rate of incisional hernia. The factors include carcinoma particularly visceral tumours, rheumatoid diseases, collagenopathy, aneamia, hypoproteinemia, avitaminosis, jaundice, diabetes mellitus, ureamia ,liver failure, ascites and alcoholism.

4) MALNUTRITION

Anaemia, hypoprotinemia, ascorbic acid deficiency etc can affect wound healing and hence contribute to the development of incisional hernias later.

5) MISCELLANEOUS FACTORS

Miscellaneous factors of unknown importance have been emphasized from time to time. The role of zinc and magnesium levels in the extracellular fluid has not been defined. Anticoagulants primarily of the coumarin family, may adversily affect

fibrogenesis, whereas heparin administration appears to involve wound healing only by virtue of a modest propensity to increase the incidence of wound hematoma.

PER OPERATIVE CAUSES

Type of incisions

Blomstedt and Welin-Berger, in a 1972 review of 279 cholecystectomy incisions, reported a 13.6% incidence of hernia following midline incision versus a 3.8% incidence following oblique subcostal incisions. Many studies advocated oblique and transverse incisions on the grounds that these are stronger and less liable to disruption. These studies made no allowance for the fact that often midline incisions are carried out in cases of great emergency, haemorrhage, trauma and sepsis or in reopening previous laparotomy wound. Compared with the midline and paramedian incisions, transverse incisions (subcostal) has lowest incidence. Most muscle and aponeurotic fibres of the abdominal wall run in an oblique or transverse orientation, with lines of force oriented horizontally. Transverse incisions run parallel to these natural lines of force in the abdominal wall and the net effect of abdominal wall tension is to reinforce the transverse wound. Vertical incisions on the other hand run perpendicular to the lines of force and the wound edges are distracted by abdominal wall tension. The lateral paramedian incision may prove to have a lower incidence of post operative hernia[11].

Layered closure

Layered closures are followed by a greater incidence of incisional hernia as compared to those wounds which were closed with single layered mass closure. Traditionally while closing abdominal laparotomy wound peritoneum is closed with catgut. Ellis 1987 repoted from a study of patients where peritoneum was closed

versus left and he found no deference in incidence of burst abdomen or incisional hernia in two groups[12]. Kirk 1972 had no wound disruption in 186 laparotomies closed with continous all coat nylon. In critical evaluation of conventional abdominal closure with single layer closure in adult and elderly by Banerjee et al 1989 showed no incisional hernia found and complications were less in single layered closure[13].

Suture length

Jonsson and colleague 1993 from a prospective trial reported that the suture length to wound length ratio is an important parameters for healing of midline incisions closed with a continous suture technique[14]. The incidence of incisional hernia is lower when such wounds are sutured with a ratio more or equal to four[25].

Suturing technique and tension

It is widely but erroneously believed that a great number of small sutures closely placed and tightly tied are neater and better than fewer, widely placed, loosely tied sutures that take a large mass bite of tissue. But the small tightly tied closely placed sutures causes ischemia and necrosis of strip of tissue along the edge leading to failure of wound closure.

Closing wound with tension is bad surgery. The lateral pull of the abdominal wall muscle against the suture, which tends, to pull them in the opposite direction, creates an area of pressure necrosis where the suture meets the tissue. This pressure necrosis is a primary cause of wound dehiscence as shown by Bartlett in 1985[10].

Ideally the wound should be closed by placement of sutures through all layers of muscle and fascia. The sutures should be at least 1.5cms from the incision edge at interval of not more than 2cms and they should be placed into solid healthy tissue.

Inappropriate Suture Material

The process of wound healing collagen formation and maturation the laying down of the collagen fibres in parallel lines according to the lines of stress, and the healed wound gaining its maximum strength takes about 1 year. Approximately 80 % of the final wound strength is reached after 6 months. It follows therefore that the wound must be supported for at least this time. The sutures are entirely responsible for the integrity of the wound for the first 6 months, so any material that does not survive and maintain most of its strength for this time is not suitable for wound closure. Corman and colleagues at the Lahay clinic evaluated three suture materials, nylon, polypropylene and vicryl in a study of 161 abdominal wall closures following bowel operations. After one year incisional hernias occurred in six patients, but none occurred in the vicryl group and they concluded that vicryl was the most appropriate suture material for abdominal closure following bowel operations. Of the remaining materials available for suturing are stainless steel, nylon, silk, polyester and polypropylene which are nonabsorbable.

Stainless Steel- it remains its tensile strength almost indefinitely. It has a low index of inflammatory response and remains strong. But it is difficult to handle.

Nylon- it loses 20% of its strength in first 50 days, but difficult to knot.

Silk- It is a braided suture material derived from the cocoon of the silkworm larvae. It is a poor suture material with tissue reaction greater than synthetic non-absorbables, because silk is a foreign protein.

Polypropylene- it is a synthetic non absorbable monofilament suture material, ideal for mass closure of the abdominal incisions. It retains its tensile strength indefinitely and excellent suture material in the presence of infection. These are very easy to handle and have reasonably good knot security provided three throws are made in

each knot. They also have a low index of inflammatory response. In 1993 Sahlin`s and colleagues from a comperative study between monofilament continous absorbable suture with multifilament interrupted absorbable suture for abdominal closure reported that closure of an abdominal incision can be effected by a monofilament continous absorbable suture more quickly than by a multifilament interrupted absorbable sutures without an increased risk of wound dehiscence or incisional hernia[15].

Drainage tubes

In 1981 Ponka pointed out that drainage tube brought out through the operative wound is a potent cause of post operative hernias[5]. Since tissue planes along the tract are not sutured, an open and weak passage is present throughout the layers of the wound, through which a hernia may develop. Since drains functions for two way traffic i.e. secretions outwards and organisms inwards to the wound. Hence after the first 24 hrs, there is a rapid raise in wound infection rate. Also the irritation caused by the drain, which is a foreign body causes oedema and tearing of tissues and cutting out of the suture. Therefore various authors recommended skin to be left open if contamination/ infection is even a minor concern. Lindner advocated in 1975 to use fine suction existing through the small para incisional stab rather than the wound proper. Wrongly placed drain will result in drain site hernia.

POST OPERATIVE CAUSES

Postoperative wound dehiscence (Burst Abdomen)

Grace and Cox, in 1976 have pointed out that a burst abdomen is an important predisposing factor to incisional herniation[16]. They found that more than one quarter of resutured burst abdomens went on to develop this complication. The fundamental causes of wound disruption are post-operative wound infection, anemia,

hypoprotienemia ascorbic acid deficiency, steroid therapy and chemotherapy. The incidence of burst abdomen can be reduced by prevention of post-operative wound infection and correction of nutritional deficiencies.

Increased post-operative abdominal pressure

Post operative complications such as prolonged ileus and chest infections increase the incidence of post operative hernias. Post operative distention, vomiting, hiccough, explosive coughing, as well as straining at defaecation or micturition, may impose stress on the freshly sutured abdominal wound sufficient to produce post-operative herniation. Prevention of atelectasis, pneumonitis, and aspiration is a combined effort of the anaesthesiologist, surgeon, intensive care nurse and most important the patient. Cessation of smoking at least two weeks before the operation is the single most important factor in decreasing the post operative pulmonary complications.

Post-operative wound infection

Post operative wound infection is the major cause of incisional hernia. Bucknell, Cox and Ellis in their series of 1126 Laparotomy closures[9], found that 48% of their patients with incisional hernia had a previous wound infection (41 of 84 patients) and those with a wound infection developed hernias almost four times more often (25% versus 7.6%). In Blomstedt's study of incisional hernia, the incidence of hernia increased five fold following a wound infection. Post operative wound infection has a high proportion for fascial necrosis with resultant loss of integrity of the closure. Furthermore, the infection causes inflammation and oedema of the tissues, which become soft and weakened so that the sutures tear the tissues and pullout under the strain of the intradermal pressure. Post-operative wound infection

can be minimised by observing certain routine precautions. These include good haemostasis, prevention of dead space, cleaning the wound prior to closure.

Systemic sepsis

Systemic sepsis at the time of the primary operation with accompanying debility, negative nitrogen balance and poor tissues healing, definitely predispose to incisional hernia. The source of infection is frequently an intrabdominal abscess or peritonitis, necessitating an operation. Even though the skin is left open for free drainage of the subcutaneous tissues, fascial necrosis or failure to heal may not be preventable. Local measures and systemic antibiotics therapy must be used generously and appropriately

INCIDENCE

In 1887 Homans stated that 10% of all abdominal operations were followed by incisional hernias. Watson in review of the subject (1948) found that incisional hernias occurred in 2 to 5 percent of uninfected abdominal operations, however when infections supervene the incidence increased to 15-30-%. Rodney Maingot stated that approximately 8% of all abdominal operations develop incisional hernia. Warren after reviewing 1000 appendicectomy performed through grid – iron incisions had 2% of post – operative hernias. It is generally recognized that the incidence of incisional hernia will be greater when vertical incisions are employed, especially if infection occurs as a complication.

. The incidence of incisional hernia is steadily decreasing in the practice of modern surgery. There was no significant difference in the incidence of incisional hernias in males versus that in females. If one considered only those operations

performed in both sexes, incisional hernias occurred more frequently in females than in males by a ratio of approximately 3:2. The great preponderance of incisional hernias in older patients is easily explained since aged patients are subject to a great variety of diseases requiring operative procedures. Obney found that the peak incidence of incisional hernias occurred in patients of 40 –70 years of age[17].

Johnson et al (1982) reviewed 213 abdominal laparotomies six months after laparotomy and noted an incidence of 13%[18]. Most studies giving incidence of Incisional Hernia give results at 6 – 12 months after operation. Ellis stated that it is accurate to state that approximately half of Incisional Hernia that are likely to occur have appeared by three months after operation[19]. In his study of 84 Incisional Hernia reviewed, he found 18 were found at one month, 30 at 3 months, a total of 20 new hernia were noted at 6 months, 15 at 12 months and one after one year. This lead to the understanding that perhaps scar tissue is more dynamic than previously been thought, so that metabolic stresses on the patient might result in some disturbances on the dynamic equilibrium of new collagen tissue.

INCIDENCE OF UMBILICAL HERNIA

Incidence of umbilical hernia at birth vary greatly. In Caucasian infants, they range between 10% to 30%. In children of African descent it may be several times greater. Premature infants commonly have umbilical hernia –even 70% or more. Majority of umbilical hernia close spontaneously during the first few year of life. By 5-6yrs of age, only about 10% are still present. However, some may continue to constrict and close through 10 year of age. Incidence of umbilical hernia in adults is unknown. Common in females, with a female to male ratio of 3;1 and it is more common in peoples of African origin.

INCIDENCE OF EPIGASTRIC HERNIA

Frequency of epigastric hernia in the general population is estimated about 5%. Ii is occasionally found in newborns and children, but is more common in early childhood and middle age. This hernia is three times more common in men than in women. Up to 20 % of epigastric hernias are multiple, but usually only one is dominant.

CLINICAL MANIFESTATION OF VENTRAL HERNIA

The common manifestation usually found in all types of ventral hernias are

- Swelling (protrusion)
- Pain in the swelling
- Vomiting
- Distension

Later stages complications like obstruction, strangulation, incarceration and gangrene. Such conditions presents as acute abdomen

CLINICAL FEATURES OF INCISIONAL HERNIA:-

Patient complain of an unsightly bulge in the operation scar as well as pain and discomfort. They often suffer from a heavy, sickening, dragging sensation aggravated by coughing and straining. In large dependent hernia's areas of skin may undergo pressure ischemic necrosis and may ulcerate, and rarely rupture. If the hernia strangulate, the symptoms of intestinal obstruction and ischemic bowel will supervene. There is often a history of repeated mild attacks of incomplete obstruction, manifesting as colicky pain and vomiting. Intertrigo may develop in the deep crease

between the hernia and the abdominal wall due to which the skin may become moist, infected and odorous.

CLINICAL FEATURES OF UMBILICAL HERNIA :-

In infants, when the baby cries or strains, the swelling appears at the umbilicus and bulges forwards. The sac may contain a loops of small bowel but if the diameter of the opening is <7 mm, the hernia is either empty or only omentum is present or enters with straining. Strangulation is extremely rare

In adults most umbilical hernias are symptomatic and these is no tendency for spontaneous closure. Adult patients with small umbilical hernias often complain of severe pain in the region, especially when coughing or straining.

Larger hernias are usually painless but uncomfortable because of their weight causing traction on the abdominal wall. Skin over the hernia is stretched and often very thin and may even be ulcerated due to pressure necrosis. Many patients seek surgery for aesthetic reasons and relief of discomfort.

CLINICAL FEATURES OF EPIGASTRIC HERNIA:

The usual Epigastric hernia is symptomless and is a chance finding by the patient or his doctor. Patient may complain of mild or severe pain in the mass and of exquisite tenderness to touch. The pain of epigastric hernia is exacerbated by exertion and relieved by rest in the supine position. Smaller hernias may become painful because of strangulation of the pre-peritoneal fat or omentum.

OPERATIVE TREATMENT OF VENTRAL HERNIA

General Principles

Unlike in other hernia repairs the most important part of the repair is not removal of the sac but closure of the gap in the abdominal wall. Whenever possible the normal anatomy should be reconstituted. In midline hernia the line also must be firmly reconstructed, in more lateral hernias there should be layer by layer closure so far as possible.

1. The incision – depends on the location of the hernia for those in the upper part of the abdomen a vertically placed median incision is best and for those occurring below the umbilicus in the midline a, transverse incision is generally preferred, As it gives a better exposure. For hernias in Macburny's incision the oblique incision is best. The incision should include the portion of the scar adherent to the peritoneum. A good deal of the skin should be excised through a ellipsoid incision, As these operations require a good deal of under mining of the subcutaneous tissues and if some portion of the skin is not scarified, the circulation is deficient and necrosis of the skin edges of the suture may occur.

2. The sac is thoroughly exposed. After the contents of the sac have seen freed and reduced into the abdominal cavity most of the sac can be resected. Vertical relaxing incisions should be made in the sheath of the rectus on each side towards the lateral edge of the rectus muscle. So that the medial edge of the fascia will not pull away from the muscle should the edges of the deficit be approximated under some tension.

3. Only tendinous/ apponeurotic/fascial structures should be sutured together.

4. The suture material must retain its strength for long enough to maintain tissue apposition and allow sound union of tissues to occur there for a non absorbable material should be used.

5. The length of the suture material is related to the geometry of the wound and to its healing. Using deep bites at not more than 1 cm intervals, the ratio of suture length to wound length must be 4:1 or more.

6. The repair of ventral hernia inevitably involves returning of viscera to the confines of the abdominal cavity and a resultant raise is intra abdominal pressure. In order to minimize this every prevention must be taken to prevent abdominal distension due to adynamic ileus which will lead to additional stress on repair suture lines. So handling of viscera should be minimized.

7. Post operative cough due to pulmonary collapse, pulmonary infection and pulmonary edema should be avoided as coughing can put an additional unwarranted strain on the suture lines.

8 The repair must be performed aseptically, inoculated bacteria, traumatized tissue and hematoma should not be features of these wounds.

Depending upon the above principles the operative methods used.

1. Repair of abdominal wall.

   a. method of anatomical layer by layer reconstruction (resuture)

   b. Cattles operation – Repair in 5 layers

2. Overlap Methods:-

   (a) Transverse overlap procedure (Mayo's imbrication)

   (b) Vertical overlap of the anterior sheaths of rectus muscle (Rutherford – Morrisons repair)

   (c) Judd's double breasting method[20].

3. Darn repairs:-

   (a) Burtons fingered fascia lata graft repair .

   (b) Maingot's keels operation .

   (c) The shoelace darn repair

4. Modern standard technique using biomaterials - Prosthetic mesh repair

PROSTHETIC MESH REPAIR

In this procedure, sheets of non-absorbable synthetic mesh prosthesis is placed across the defect and stitched to the abdominal wall. This has rendered obsolete most of the older types of operation. This is an excellent method of repair preferred for patients with large defects of the anterior abdominal wall following post operative infections with facilities and sloughing of the tissues of the abdominal wall, or for cases involving trauma or excision of the sections of the abdominal wall for tumors or after multiple attempts at repair of a post operative hernia with destructions of tissues and also large umbilical/para umbilical epigastria and spegilian hernias. The repairs of large ventral hernia has been simplified by the use of synthetic mesh prosthesis. The type of repair of ventral hernia is determined by the size and the site and the incision originally used. It is more fragment to have a resort to the use of mesh prosthesis in the large lower abdominal wall hernia than with the upper abdominal type. In the repair of the upper abdominal hernia, because of the anatomy of the rectus muscle, flap and releasing. The rectus abdominal muscle is still be well supported by a strong aponenrotic posterior sheath and thus additional reinforcement with a mesh prosthesis is not always required in the lower abdomen. The fascine posterior to the muscle is weak and provides a little support, so that flaps or relaxing incisions in the anterior sheath without a mesh prosthesis would result in a week repair, as most patients are elderly and obese, pre-operative physiotherapy, weight reduction stopping of smoking is necessary to avoid post operative complications.

CHOICE OF MATERIAL: the ideal mesh is one that is cheap and universally available, is easily cut to the required shape, is flexible, slightly elastic and peasant to

handle additionally, It should be practically indestructible and capable of being rapidly fixed and incorporated by human tissues. It must be inert and elicit little tissues reaction and consequently, not rejected, even in the presence of infection. It must be sterilized and non-carcinogenic. Polypropylene mesh (prolene, Marlex) meets the requirements of the ideal prosthesis and is today the most commonly used material for repair of all type of ventral hernia. It consist of mono filament thread of polypropylene, knitted in fairly loose manner. It stimulates almost no biological response from the tissues/significant rejection and is rapidly incorporated by fibroblasts and granulation tissue that pass through and fill the interstices between the knits. There are no crevices and the surfaces of the thread is extremely smooth, so that it is hardly colonised by bacteria and thus withstands infection exceptionally well. Even when exposed in an infected wound it will be covered rapidly and incorporated by the granulation tissue. Poly propylene mesh can be cut to any shape, It does not unravel, and holds sutures exceptionally well without tearing. If a sheet is not large enough, it can be joined to other sheets by simple continuous suture with a monofilament poly propylene mesh. It remains pliable in the tissues and can be easily incised. If a new laparotomy becomes necessary. Next most popular is also a knitted mesh but has a multifilament polyester fiber thread (acron, merselene). This is an excellent material, cheap freely available and is very popular in French surgical centers.

Advantages:- It is light and extremely supple, has a pleasant soft feel, and it is strong and elastic. Because of its softness it easily conforms to all shapes ad surface without any tendency to recoil. Its surface is slightly granular and excite a greater tissue inflammatory response than poly propylene It creates rapid invasion of the mesh by fibrostasts and granulation tissue helps to fixing the mesh in the tissues.

Types of operation: Diffenrent types depends upon the position of the mesh in the defect

LAY TECHNIQUE : mesh implanted between the subcutaneous tissue and abdominal wall.

1) **ONLAY TECHNIQUE :-** mesh implanted between the subcutaneous tissue and abdominal wall.

2) **INLAY TECHNIQUE :-**

Two types:-

a) Mesh implanted between two rectus muscle.

b) Mesh placed between rectus muscle and posterior rectus sheath (Rives stoppa's)

3) **SUB LAY** _ two types

a) Sub lay - extraperitoneal / properitoneal

b) Sub lay – Intra-Peritoneal /Preperitoneal

4) **SANDWITCH METHOD**

Onlay and sublay mesh used simultaneously

OPERATIVE TECHNIQUE:- with pre-operative preparation of the patient, with broad spectrum antibiotics immediately prior to operation, and the patient is catheterized and Ryles tube is inserted. Because of the large surface area of skin exposed during the procedure. The skin is prepared by cleaning, with antiseptic lotions. Operation done under general anesthesia, appropriate incision is put and umbilicus is excised only if necessary careful dissection is necessary when the scar is excised as then is usually no subcutaneous tissue beneath it, and the peritoneum with adherent viscera lies immediately below. After the Scar has been removed, the skin edges are grasped with forceps and elevated by the assistant. The hernial sac is identified and dissected from the skin and subcutaneous fat surrounding it, clearing

the fat off the rectus sheath and the aponensosis and muscle of the external oblique. This is rapidly achieved by entering a well defined plane that requires both blunt and sharp dissection. The hernial sac is opened vertically along the middle, and its inner surface, as well as the peritoneal surface of the anterior abdominal wall is cleared of all adherent omentum and bowel. Except in cases of hernia associated within intestinal obstruction/ if the sac has secondary herniations/omental adhesions.

The bed for the permanent Mesh prosthesis is prepared is depends on the type of mesh repair. The full size of mesh is used. It should be larger than the length of the defect and wide enough to stretch from one lateral edge of the rectus sheath to another. The sheet then is fixed under slight tension with a few non-absorbable monofilament synthetic sutures. All sutures are passed through the edges of the mesh. The upper and lower edges of the mesh are sutured. If the hernial defect reaches the upper part of the abdominal wall, the upper edge of the mesh is passed down to lie under the diaphragm. If it reaches lower abdomen below the arcuate line of douglas, the graft comes to lie in the plane should be long enough to hang into the pelvis in the retropubic space of Retzius and in the space of Bogros. In this case it should be fixed with a few sutures to the back of the pubis and along the pectineal lines. After this good hemostasis achieved by cauterizing all bleeding points and Romovac drain is placed above and below the mesh or dependent area and fixed to skin. The subcutaneous tissue layer is approximated with using either chromic catgut or vicryl 3-o with inverted, and interrupted stitches. Skin is closed with ethylene 2-0 silk. Wound is cleaned with betadine and dressing of the wound done with fresh gauze and pads.

POST OPERATIVE COMPLICATIONS

I GENERAL COMPLICATIONS

1. **Gastro-intestinal complications : Paralytic ileus**

Ileus may result after repair of large ventral hernia due to mobilization and excessive handling of intestines. Ileus contributes to poor healing through increased intra-abdominal pressure with the resultant impairement of circulation to the repair site. Increased stress upon a healing wound may results in recurrence of hernia. When there is a post operative distention and paralytic ileus, gastric aspiration and intravenous fluids are necessary. If the patient is nauseated, he should have nothing by mouth until nausea cases. Often on the third post-operative day in an uncomplicated case, to avoid excessive straining at defaecation. It is necessary to give a mild purgative.

2. Pulmonary complications

Respiratory tract diseases places increased stress on the suture line by increasing the intra-abdominal pressure. Allergic conditions causing coughing or sneezing should be properly treated. Basilar atelectasis and frank respiratory distress sometimes complicated, when contents of a massive incisional hernia are reduced into the abdominal cavity. These complications can be prevented by providing respiratory therapy for 12-24 hours or even longer.

3. Urinary complications:

After operations on lower abdominal incisional hernias, often the patient will have retention of urine. Catheterisation of the bladder with an indwelling Foley's catheter obviates this complication.

4. Thrombophlebitis:

When the contents of the massive hernial sac are reduced into the abdominal pressure causes venous hypertention in the lower extremities, presumably with an increase in incidence of deep vein thrombosis in lower extremities. This can be prevented by low dose anticoagulant therapy continued until the patient can walk and ready for discharge. Active limb movements in early post-operative period is also helpful.

II LOCAL COMPLICATIONS

1. Seroma.
2. Hematoma.
3. Infection.
4. Sinuses.
5. Tenderness.
6. Induration.
7. Skin necrosis.
8. Wound disruption.

General complications are managed as in any other major abdominal operations.

LOCAL COMPLICATIONS:

SEROMA: Collection of abnormal amounts of serous fluid occurs in 5-7% of patients who underwent surgery. Accumulation of fluid in the area of repair varies in amount and duration from patient to patient. The degree of dissection appears to be a factor as is the implantation of a mesh. Treatment of seromas consists of aspiration under aseptic conditions when the collection is large and troublesome. Smaller collections are not withdrawn they disappear in a few weeks they disappear. Sharp dissection,

avoidance of excessive dissection, and use of suction catheter drains postoperatively are preventive measures. Pressure dressings may also help in reducing the incidence of seromas.

HEMATOMA: Excessive collection of blood in the operative areas was seen in nearly 3% of patients. Hematoma obviously result from imperfect hemostasis. When retension sutures are placed more or less blindly injury to blood vessels can occur. At other times, bleeding may occur in an area previously considered to be dry due to reactionary haemorhage. Small hematomas should be debrided or evacuated as is any other devitilized tissue. Evacuation of hematomas should be done with strict aseptic precautions followed by administration of broad spectrum antibiotics. With the use of suction drains the incidence of hematoma has come down significantly.

WOUND INFECTION: wound infection is a substantial threat to the successfull repair of incisional hernias. Obese patients, wide areas of dissection and the presence of a cicatrix are conditions favouring the development of infection. Major wound infection was seen in 2 % where as minor infection such as superficial infection with minor skin loss at the margins of the wound was seen in 3% of patients.

Minor infections:

These are superficial infections associated with minor skin loss at the margins of the wound. Others are associated with retained sutures. Treatment consists of debridement of the necrotic skin, removal of the trouble some sutures and application of sterile dressings.

Major infections:

These are suppurations which occur in the depth of the wounds. These patients will be ill with fever and chills and leuocytosis accompany the onset of infection. Drainage of the wound is essential. Culture and sensitivity should be obtained. Antibiotic irrigations may be used. Systemic antibiotics are essential.

ABDOMINAL WALL SINUSES: Two mechanisms account for abdominal wall sinuses following incisional hernia repair. Minor problems arise when a suture (such as silk, wire or synthetic) is present along, with a low grade superficial infection. In such cases an area of redness, swelling and eventual drainage develops about the suture, which continues to serve as a nidus of infection, until it is extruded or removed surgically the sinus does not heal. The second mechanism involves sheets of implanted material that subsequently become infected. In most cases the problem of infection manifests itself early in the postoperative period, ultimately remove of the mesh becomes necessary. In a few patients, infection and abdominal wall sinuses develop in the recovery or late postoperative period without early evidence of infection. In any case the infected area must be drained adequately, nonabsorbable suture material must be removed. Many early infections will respond to drainage, irrigation and antibiotic therapy, but in a few cases the infection will not be cure until the mesh is removed. The incidence of infection and sinuses was about 2 percent. It was more frequent with tantalum mesh than with prolene or marlex mesh.

WOUND INDURATION AND TENDERNESS:

Wound induration and tenderness following implantation of prosthetic material are seen in some patients. The tenderness was more when the implant is placed in the subcutaneous position. Induration may result as a response to trauma of the procedure and fibroplasia is an expected response to implantation of various materials. Infection was not a factor in these cases. Reassurence, warm applications and analgesics were helpful. The pain gradually diminishes in nearly every patient. Skin necrosis was a sequaele of tight skin sutures and superficial infection. Wound disruption was due to suppuration in the depth of wound. Secondary suturing should be undertaken in cases of wound disruption after the infection is totally controlled.

RECURRENCES AND MORTALITY

R.S.Smith used Tantalum mesh in 18 cases and Marlex mesh in 14 cases of incisional hernia repairs. He noted 12 recurrences in Tantalum mesh group and 1 recurrence in Marlex mesh group. In M.J.Notaras (1974) series of 32 Anatomical repairs of incisional hernia, there were no recurrences. The mortality rate for incisional hernia surgery with adequate pre operative preparation, using modern anaesthetic agents and performed by an experienced surgeon should approach zero. Among 130 patients of Adoff and Arnaud (1987) series who underwent Mersilene mesh repair for large incisional hernias, the reported mortality rate was 1.5% (2 deaths).

MATERIALS AND METHODS

All patients detected to have ventral hernia during the period of January 2009 to July 2011 were studied at Coimbatore Medical College Hospital. The total number of cases studied were 50 which included all forms of ventral hernia such as umbilical, paraumblical, epigastric and incisional hernia.

Inclusion Criteria:

1. All cases of ventral hernia
2. Patients above the age of 12 years.

Exclusion Criteria:

1. Patients below the age of 12 years
2. Cases where follow up is not possible Eg: Patients is not tracable during post operative period.
3. Ventral hernia less than 3 cms.
4. Ventral hernia presenting with strangulation where mesh repair is not feasible.

All patients underwent thorough clinical examination and a detailed history of earlier operation were asked. All patients were simultaneously evaluated for any systemic disease or any precipitating cause. Patients who had associated hypertension, diabetes mellitus or cough were controlled and monitored pre operatively.

Routine investigations like Hb, TC. DC, BT, CT, Urine analysis and blood grouping and cross matching were done. All cases were underwent ECG, Blood Sugar (Fasting and Postprandial), blood urea and serum creatinine, HIV/ HbsAg investigations. Chest X-ray and USG was done in all cases. Pre-operative fitness was obtained. Some cases cardiology opinion taken and ECHO was done as per the cardiologist advise. 50 cases were operated on elective basis.

All cases were admitted prior to surgery to permit pre-operative investigations and preparation. A day prior to surgery, shaving of the abdomen, genitalia, perineum and back was done. Overnight patient was kept fasting. All patients were asked to take scrub bath in the morning on the day of surgery. A Ryle's tube was passed and broad spectrum antibiotic was given to all patients in the operation theatre.

In the operation room patients underwent thorough skin preparation over area of operation with povidone – iodine solution. Abdomen was drapped. Operations were done under general anaesthesia / spinal anaesthesia or epidural anaesthesia. In all cases of incisional hernia old operative scar was existed. Generous skin incisions were used to permit adequate exposure of hernial sac and defect, depending upon the type of hernia. Skin flaps were raised till hernial defect could be clearly defined and peritoneum was opened and hernial contents were reduced after lysis of adhesions. Redundant hernial sac was excised and muscular –aponeurotic structures repaired with prosthetic mesh, care was taken to place suture in the healthy tissues only. Prosthetic mesh repair was done with onlay technique. Wound was then closed after insertion of suction drain. In all cases non absorbable suture material was used to close musculoaponeirotic structures. Suction drain tube was meticulously anchored to the abdominal wall.

In post operative period nasogastric aspiration was done 2nd hourly in first 24 hours. Ryle's tube was removed once patient passed flatus. Bladder catheterization was done if patient was unable to pass urine. Suction drain was removed once drainage was below 25cc in 24 hours. Antibiotics were continued till the removal of sutures. Post operatively deep breathing exercises and movement of limbs in bed was advised as soon as patient recovered from anaesthesia. Early limited ambulation was

done once patient was able to bear pain. IV fluids were continued till passage of flatus, thereafter patient received liquid diet and later soft diet.

Skin sutures were removed on 8^{th} day or 10^{th} day and patient discharged on same day or next day. At discharge patients were advised to restrict their activities for first six months. Obese patients were advised to shed weight. Patients were called for review every weekly upto 6 weeks. At the time of review the patients were asked for any symptoms and operative site examined for any short term complications. These cases were then analyzed and results were compared with existing literature. An extensive review of literature is also carried out.

Statistical analysis was made with Chi- square and Fischer Exact test to find the significance of proportion of incidence of post operative complications in association with risk factors

1. Chi- square test

1. Chi-Square Test

$2 = \frac{\sum(\quad)}{\quad}$ where Oi is observed frequency and Ei is Expected frequency

2. Fischer Exact test

	Class1	Class2	Total
Sample1	a	b	a+b
Sample2	c	d	c+d
Total	a+c	b+d	n

$$\sum p = \frac{(\quad)!(\quad)!(\quad)!(\quad)!}{!} = \frac{}{\sum \quad ! \quad ! \quad ! \quad !}$$

OBSERVATION & RESULTS

The total number of cases studied in this series was 50 cases of ventral hernia admitted in Coimbatore Medical College hospital from Jan 2010 to July 2011.

Study design: A prospective clinical study consisting of 50 patients with ventral hernia who underwent mesh repair was undertaken to study the short term complications following the ventral hernia repair with prosthetic mesh and its association with risk factors. The following were observed

TABLE: 1
TYPES OF HERNIA

Total no:of ventral hernias	Incisional hernia	Paraumbilical hernia	Umbilical hernia	Epigastric hernia	Combined hernia (inguinal with umbilical hernia)
50	27	6	7	10	2

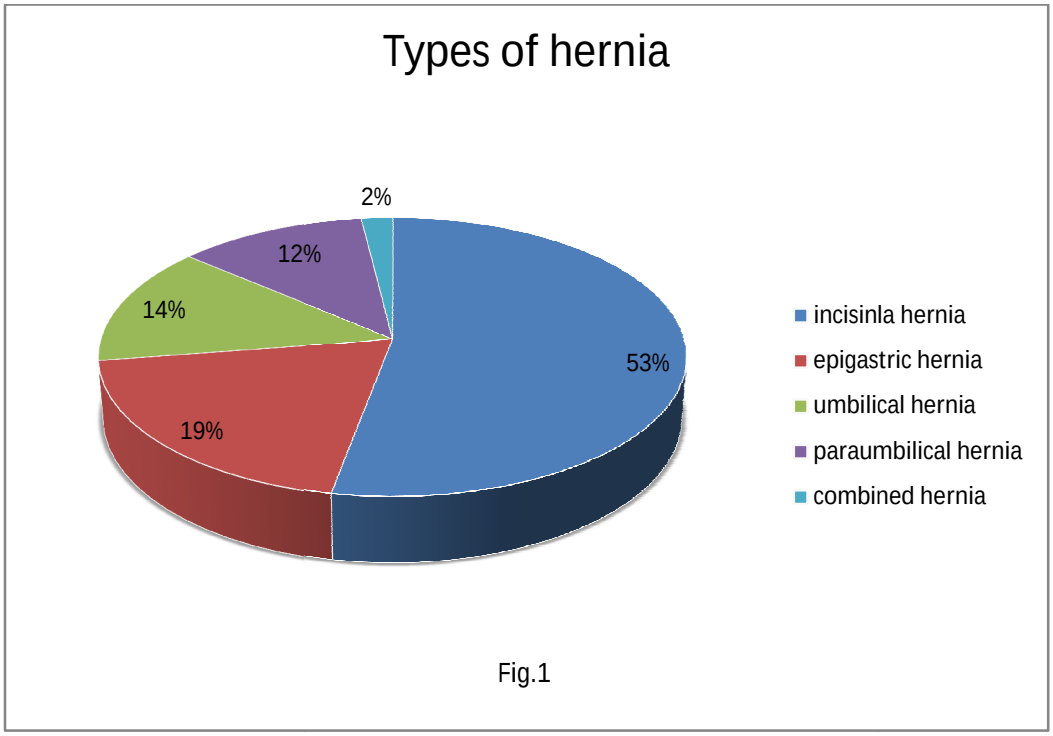


Fig.1

Out of the 50 patients studied 27 were incisional hernias, 6 were paraumbilical hernias, 7 umbilical hernias, 10 epigastric hernias and 2 patients had both inguinal as well as umbilical hernias.

TABLE 2A

Sex distribution of hernia

Sex	No: of patients
Male	8
Female	42

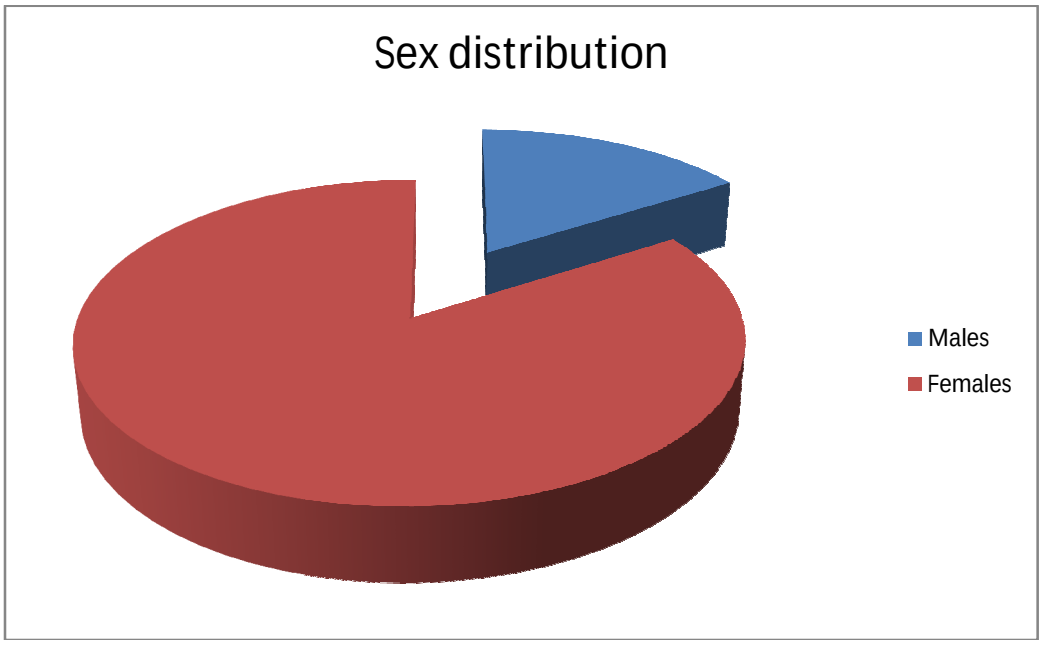


Fig.2A

The study showed that out of the 50 patients studied 42 were females and only 8 were males. This clearly indicates that the incidence of ventral hernia is more common in females.

TABLE : 2 B

Age distribution with sex

Age in years	Male		Female		Total
	Number	percentage	Number	percentage	
21-30			6	14	6
31-40	1	12	10	24	11
41-50	7	88	10	24	17
51-60			13	31	13
61-70			2	5	2
71-80			1	2	1

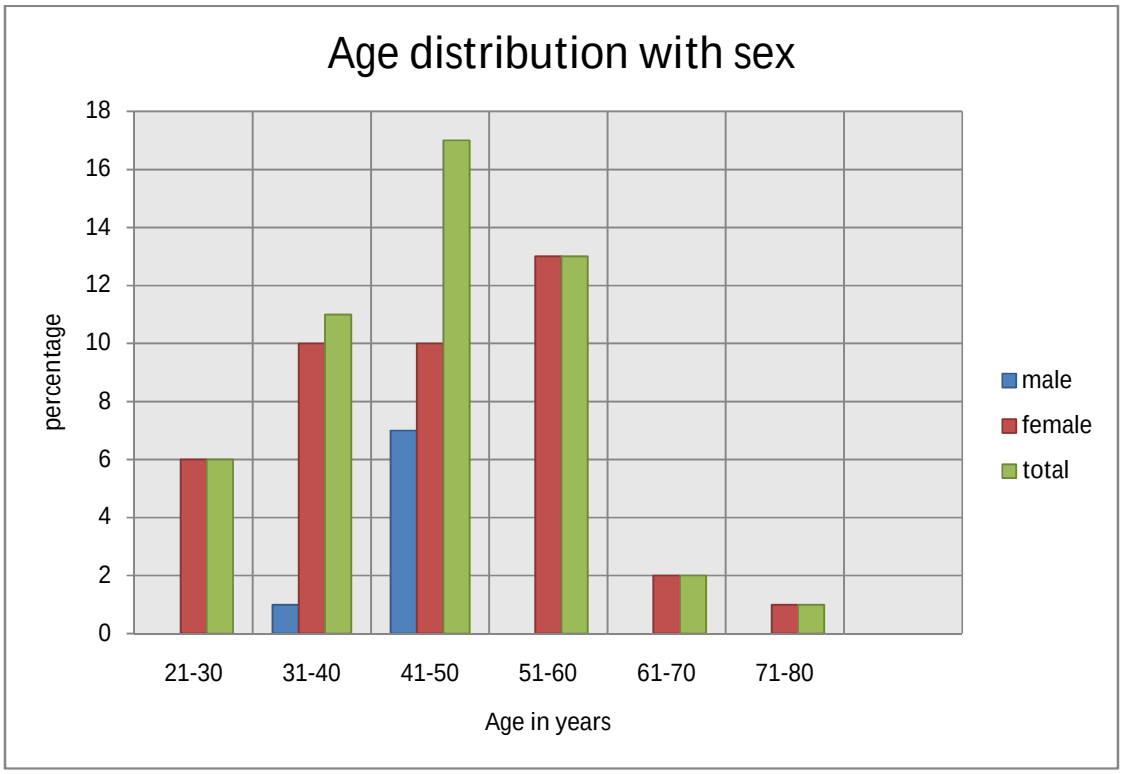


Fig 2B

The study revealed that the incidence of ventral hernia is more in the 41 to 50 year age group as well as in females it is common among 51 to 60 year age group.

TABLE: 3

Sex incidence in different types of hernia

Type of hernia	Male	Female
Incisional hernia		27
Epigastric hernia	4	6
Umbilical hernia	1	6
Paraumbilical hernia	3	3

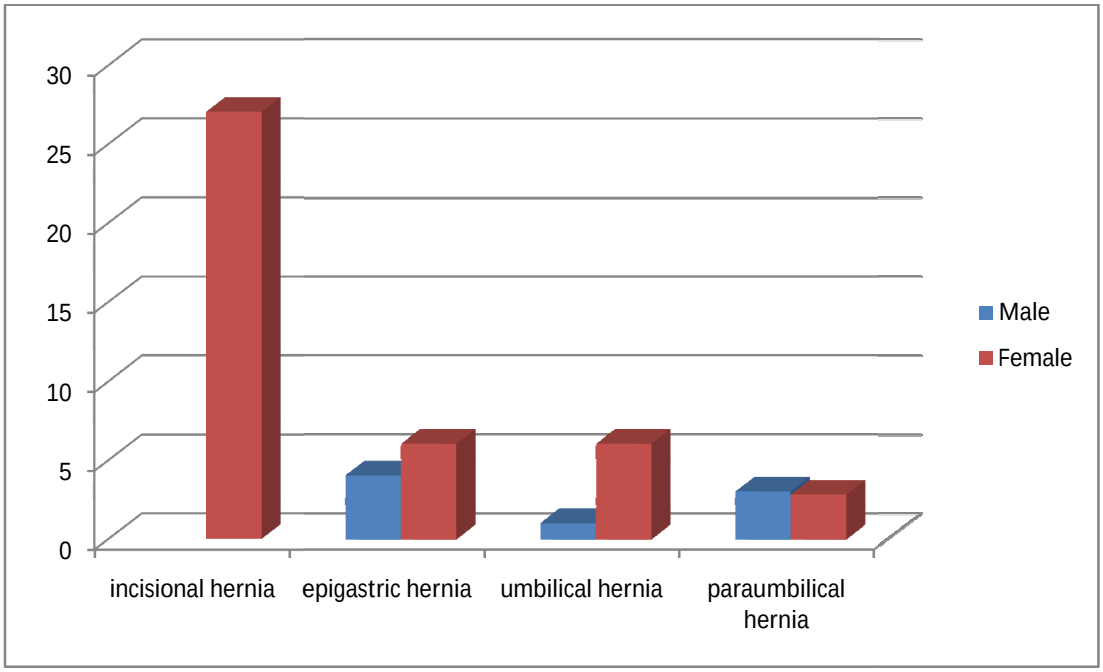


Fig .3

All types of ventral hernia are more common in females than in males. Incisional hernia occurs commonly in females than in males.

TABLE: 4

Types of ventral hernia

Type of hernia	Number N=50	percentage
a. Primary		
Epigastric hernia	10	20
Umbilical hernia	7	14
Paraumbilical hernia	6	12
b. Secondary		
Incisional hernia	27	54

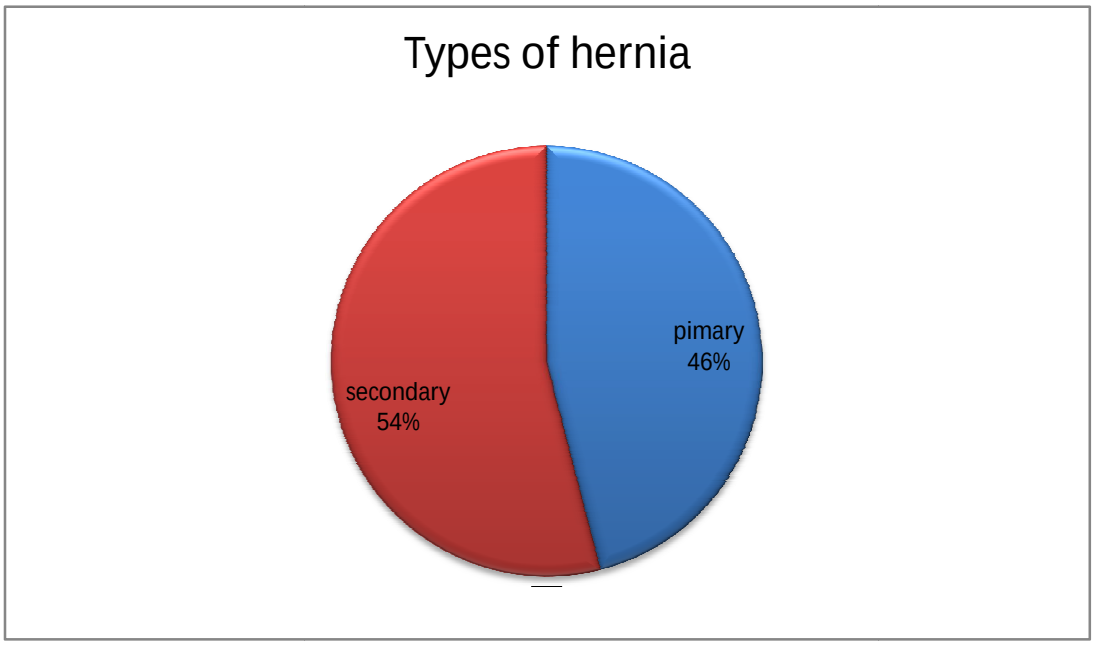


Fig.4

Secondary or acquired hernias are more common than primary hernias. Secondary hernia constituted about 54% of cases while primary hernias were 46%.

TABLE: 5

Presenting symptoms in different types of hernias

Presenting complaints	Number	percentage
Swelling	50	100
Pain	11	22
Vomiting	6	12
Irreducibility	5	10

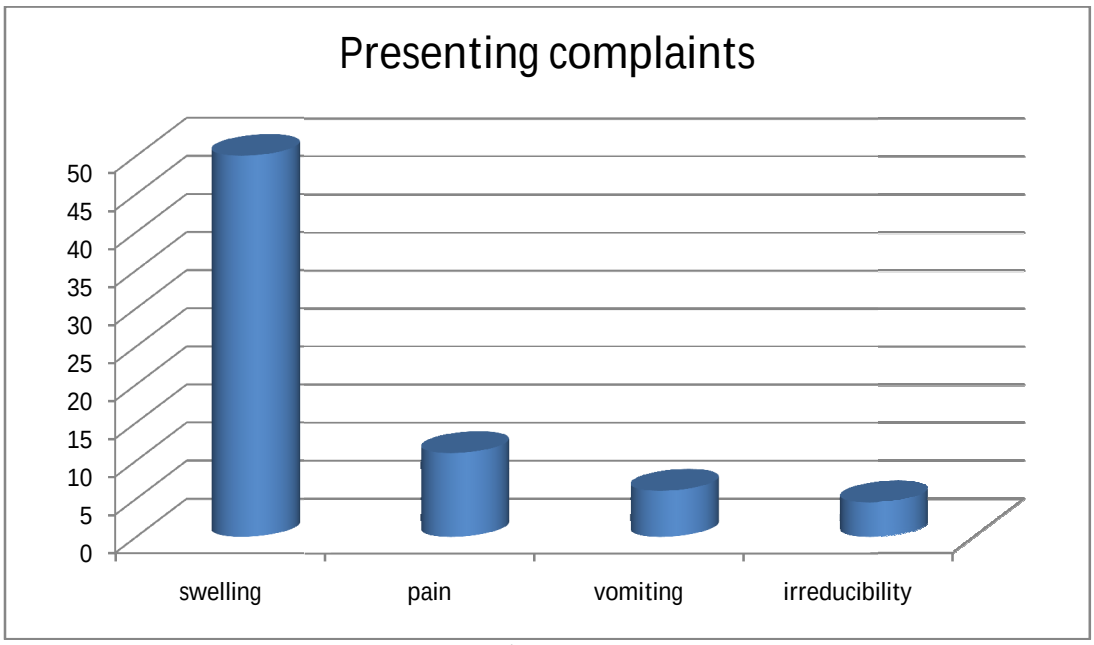


Fig. 5

All patients with ventral hernia presented with complaints of swelling. 22% of the patients presented with pain while 12% presented with vomiting and 10% presented with an irreducible swelling.

TABLE: 6

Types of previous surgery in incisional hernia patients

Previous surgery	Number	Percentage
LSCS	10	38
Tubectomy	3	11
Hysterectomy	5	19
Appendicectomy	3	11
Cholecystectomy	3	11
Laparotomy	1	3
Laproscopic surgeries	2	7

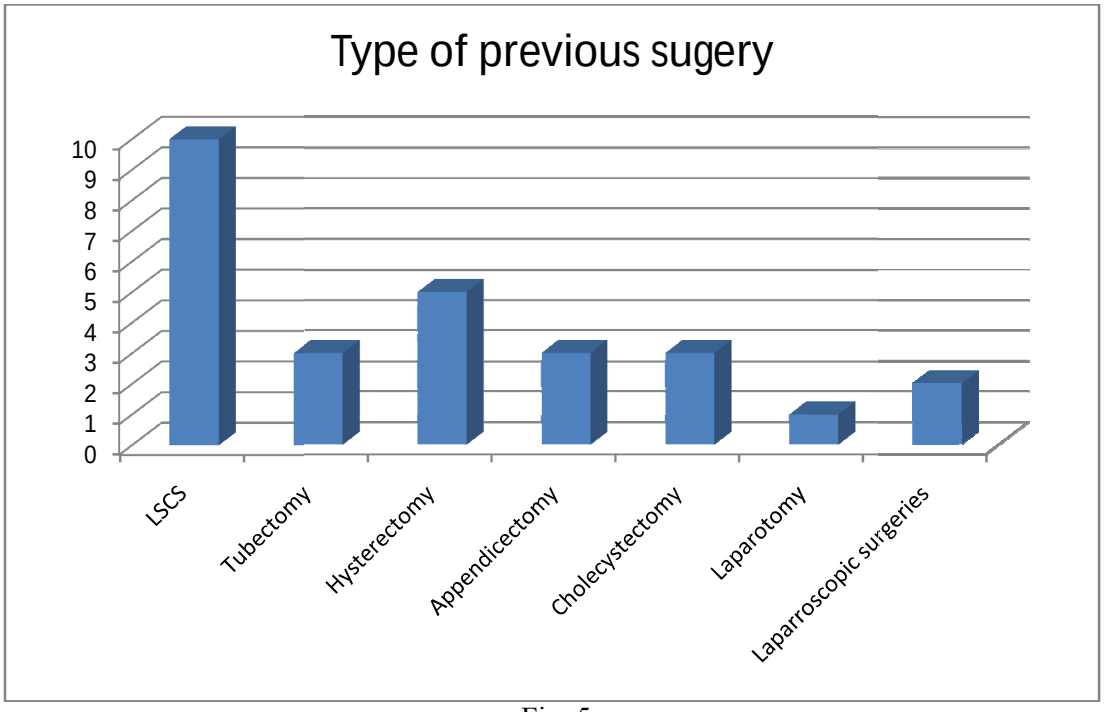


Fig. 5

The incidence of incisional hernia seems to be more after gynaecological surgeries. In this study maximum number of incisional hernias occurred following LSCS.

TABLE: 7

Type of previous surgery - emergency or elective in incisional hernia

Type of previous surgery	Number	Percentage
Emergency	14	54
Elective	12	46

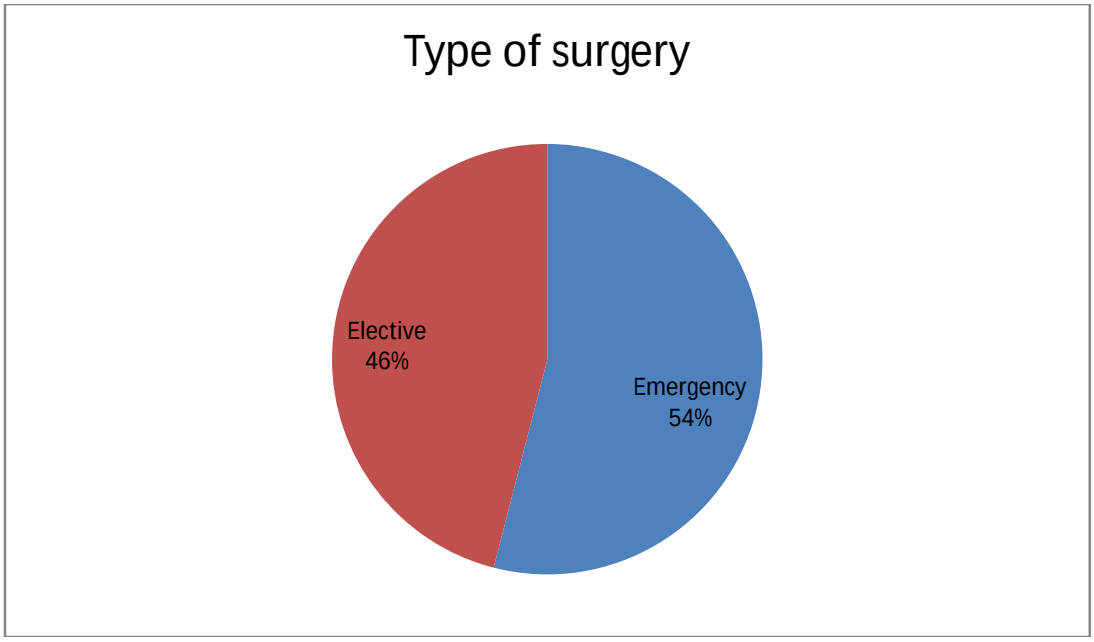


Fig.7

The study revealed that the incidence of incisional hernia is more with emergency than elective previous surgeries. Out of the 27 incisional hernia patients 54% underwent their primary surgery as an emergency procedure.

TABLE: 8

Type of incision used in previous surgeries

Type of incision	number	percentage
Transverse infraumbilical	15	55
Subcostal	3	11
Midline infraumbilical	3	11
Mac Burney's	3	11
Midline	1	4
Laproscopic port site	2	8

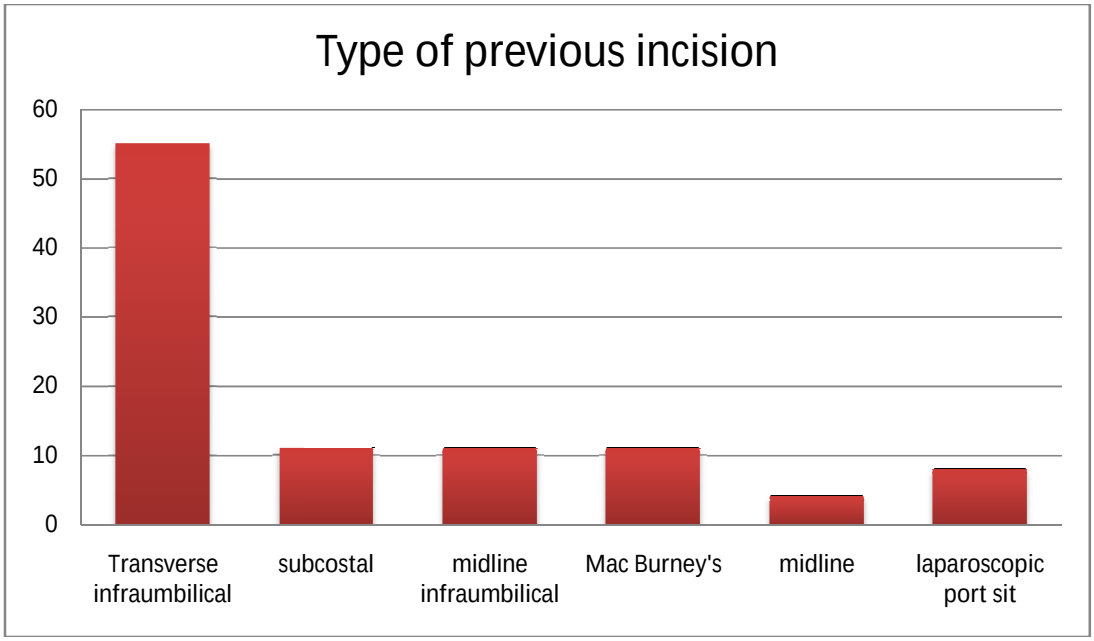


Fig.8

The study shows that the incidence of incisional hernia is more with transverse infraumbilical incisions. Out of the 27 patients of incisional hernias 15 had transverse infraumbilical incision in the previous surgery.

TABLE: 9

Complications of previous surgeries in case of incisional hernias

Complications of previous surgeries	**Number**
Wound sepsis	13
Cough & COPD	6
Paralytic ileus	3
Combined wound sepsis & cough	2
No complications	9

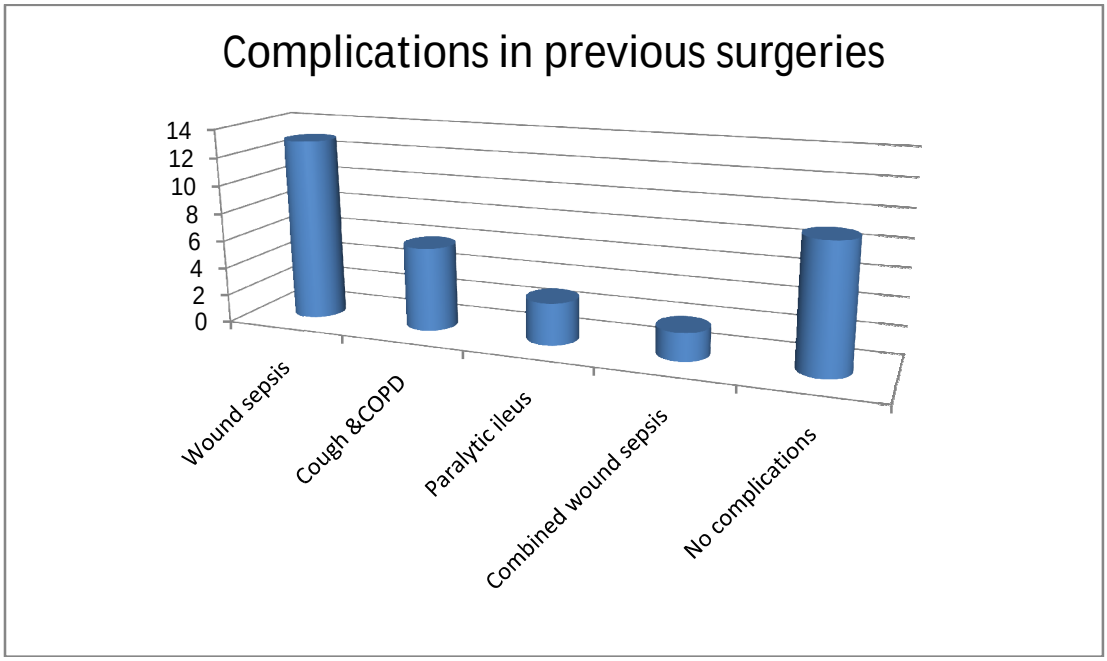


Fig.9

The study showed that wound sepsis during post operative period of previous surgery increases the incidence of incisional hernia. Out of 27 patients with incisional hernia 9 did not have any complications during the post operative period of the previous surgery. 13 had wound sepsis, 6 had cough and 2 patients had both wound sepsis and cough.

TABLE: 10

Risk factors predisposing to post operative complications

Risk factors	No: of patients
Obesity	14
Cough (COPD &BA)	5
Diabetes mellitus	8
Hypertension	3
BPH	1
Constipation	1
None	25

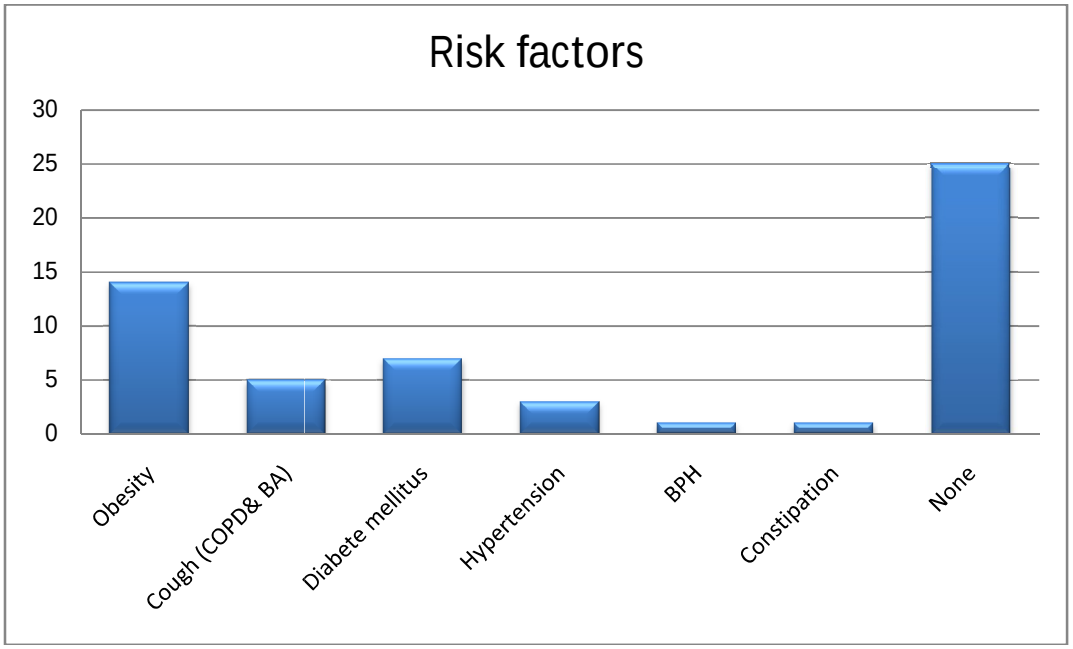


Fig.10

Obesity was the most important risk factor that predisposed to the development of post operative complications. Out of the 50 patients ,14 were found to be obese, 7 were diabetic, 3 were both diabetic and obese.

TABLE: 11

Post operative complications

Complications	Number	Percentage
Seroma	4	8
Haematoma	1	2
Wound infection	4	8
Skin necrosis	2	4
Wound dehiscence	4	8
Sinus formation	1	2
Pulmonary complications	2	4
GI complications	2	4
None	30	60

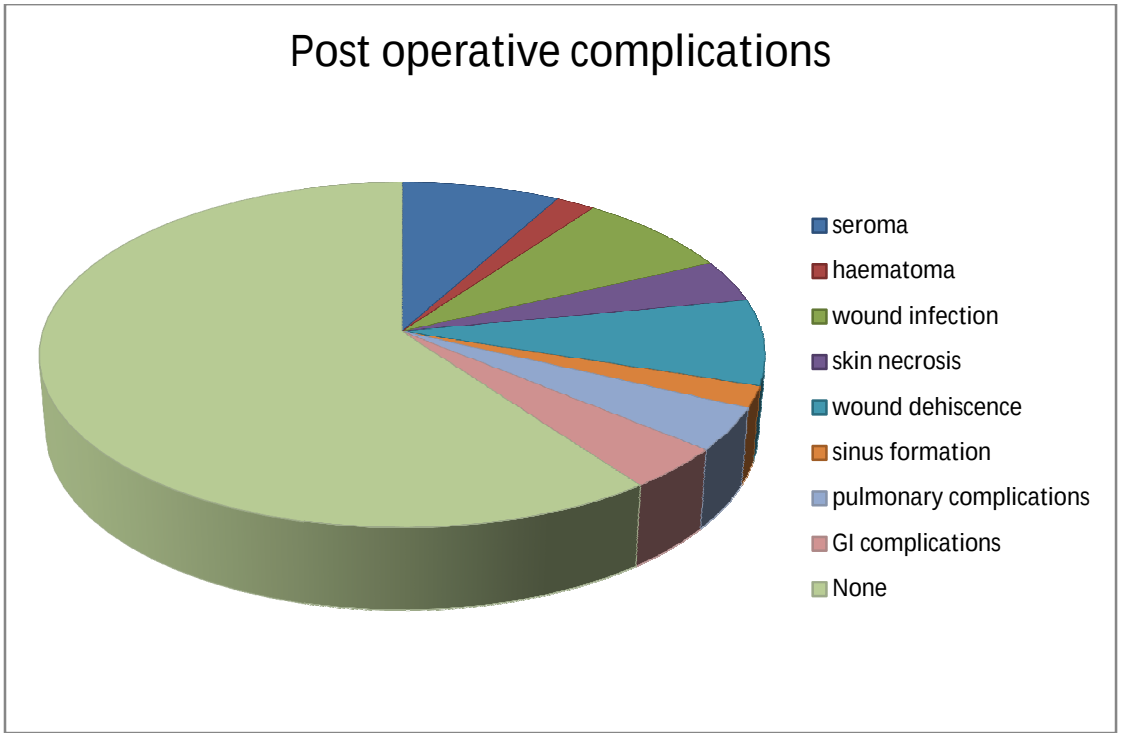


Fig.11

Out of the 50 patients, 20 developed post operative complications. The most common complications were seroma, wound infection and wound dehiscence (8%). The other complications were skin necrosis, haematoma, sinus formation, pulmonary and GI complications.

TABLE: 12

Association of risk factors with complications

Risk factors	Complications			P value
	Present	Absent	Total	
Age<45 yrs	6	17	23	0.0858
Age>45yrs	14	13	27	0.0858
Males	2	6	8	0.4501
Females	18	24	42	0.4501
Obesity	10	4	14	0.0089
Diabetes mellitus	7	1	8	0.0046
Cough	4	2	6	0.2185
Hypertension	2	1	3	0.5561
BPH	0	1	1	
Constipation	0	2	2	

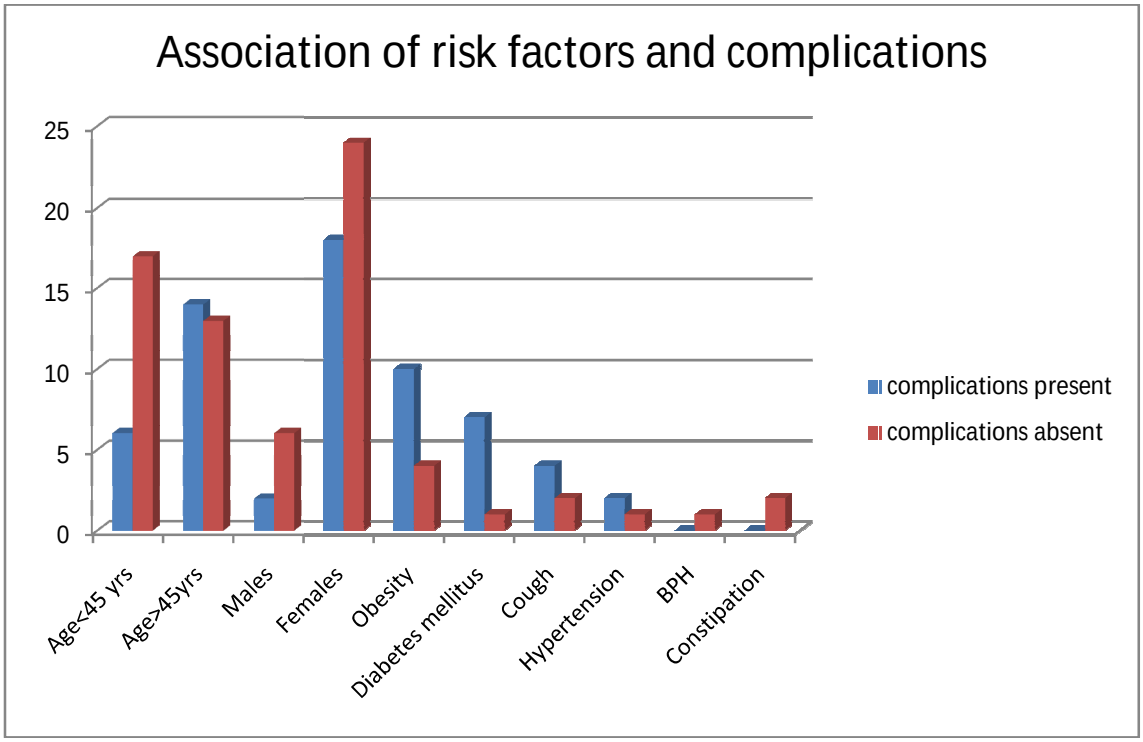


Fig. 12

Obesity and diabetes mellitus are positively associated with the occurrence of post operative complications.

INCISIONAL HERNIA

UMBILICAL HERNIA

MESH REPAIR

POST OPERATIVE COMPLICATIONS

WOUND INFECTION

SKIN NECROSIS

WOUND DEHISCENCE

DISCUSSION

Fifty cases of ventral hernia were studied in this study. The incidence of ventral hernia has been stated variously in different studies. The incidence was incisional hernia 54%, epigastric hernia 20%, umbilical hernia 14% and paraumbilical hernia 12% in this study (Fig.1). This shows that the most common type of ventral hernia is post operative/ incisional hernia which is comparable to literature standards.

The study showed that out of the 50 patients of ventral hernia 84% were females and only 16% were males (Fig. 2A). This clearly indicates the incidence of ventral hernia is more in females than in males. This is because of the laxity of abdominal muscles due to multiple pregnancy in females. In males most of the operations are above the umbilicus and the integrity of the abdominal wall is good because of well developed muscle and fascia, so the incidence of incisional hernia is rare.

The incidence of ventral hernia was found to be more in the 41 to 50 year age group in both males and females (Fig.2B). Out of the 50 patients 17 were in this age group. But the incidence in females was seen more in the 51 to 60 year age group.

Almost all types of ventral hernia showed a female preponderance in this study with incisional hernia almost exclusively seen in females (Fig.3). Even though incisional hernia can occur in males mostly following surgery for penetrating injuries, no cases were reported during our study period.

Ventral hernias can be primary or secondary. Primary ventral hernias are umbilical, paraumbilical, epigastric and spigelian hernias. Secondary ventral hernias are incisional/ post operative hernia. The study revealed that secondary ventral hernias (54%) are more common than primary (Fig.4).

All patients with ventral hernia presented with a swelling. 22% presented with pain while 12% had vomiting. Only 10% presented with irreducibility (Fig.5) Although ventral hernia can produce different kind of symptoms, swelling is the one that compels the patient to seek medical advice.

The study showed an increased incidence of incisional hernia in patients who have undergone some kind of gynaecological surgeries. 38% had a previous LSCS while 19% had undergone hysterectomy (Table 6). Most of them had a infraumbilical incision in the previous surgery. In this study transverse infraumbilical incision in previous surgery showed to have a higher incidence of incisional hernia (Fig 8). This is due to the fact that intraperitoneal hydrostatic pressure varies in the erect position. The upper abdominal pressure remains at 8cms of water while the lower abdominal pressure increases to 20 cms of water in erect position. Absence of posterior rectus sheath below the arcuate line in the lower abdomen also contributes.

In this series, out of 27 patients with incisional hernia, 14 patients had undergone a emergency primary surgery while 12 patients had an elective primary operation (Fig.7). The incidence of incisional hernia seems to be higher in patients with an emergency primary surgery.

Out of the 50 patients, 27 patients were incisonal hernias and had their previous surgery elsewhere. All details of previous surgery were not available. However in the final analysis wound sepsis in the post operative period of the primary surgery (13 patients out of 27) emerged as the commonest factor responsible for the development of incisional hernia (Fig.9). Abdominal distension and chest infection were other significant factors.

In this study out of 50 patients who underwent mesh repair for ventral hernia, 20 patients developed post operative complications. The most common

complications being seroma, wound infection and wound dehiscence (8%). The other complications were haematoma (2%), skin necrosis (4%), sinus formation (2%), pulmonary (4%) and GI (4%) complications (Fig.11). This is comparable with literature standards.

Out of the 20 patients who developed post operative complications 7 were diabetic and 10 were obese (Table 10). Other risk factors noted were hypertension, cough, BPH and constipation. Out of the 14 obese patients, 10 developed post operative complications. It was found that obesity was significantly associated with the development of post operative complications ($p= 0.0085$). The obese patients being 6.5 times more at risk of developing post operative complications compared to non obese patients (Table12).

Likewise diabetes mellitus also had a positive association with the development of post operative complications ($p= 0.0046$). The association of other risk factors were not statistically significant.

All cases were followed up to 6 weeks of postoperative period. There was no mortality in this study.

CONCLUSION

1. Ventral hernia is the second most common hernia after inguinal hernia
2. Maximum age incidence in this study is between 41 to 50 year age group, more in females compared to males.
3. All ventral hernias have a female preponderance.
4. In all ventral hernias, the common presentation is swelling
5. The incidence of incisional hernia is more common after gynaecological surgeries(57%)
6. Incisional hernia more common in infraumbilical incision in primary surgery
7. The occurrence of incisional hernia more after an emergency primary surgery.
8. Wound sepsis during the post operative period of primary surgery is the commonest factor responsible for development of incisional hernia
9. The most common post operative complications were seroma, wound infection and wound dehiscence.
10. Patients with obesity are 6.5 times more likely to get post operative complications with p value= 0.0085.
11. Patients with diabetes mellitus are more likely to get post operative complications with p value= 0.0046
12. Short term complications in our series are equal to literature standards.
13. Thorough preoperative skin preparation, selection of appropriate operation with expertly administration of anesthesia are essential for excellent results. Meticulous operative technique, use of non absorbable sutures to close musculoaponeurotic layer is also needed for good results. Musculoaponeurotic

layer closed with simple anatomical closure or double breasting, avoidance of any undue tension on suture line, use of suction drain, perioperative good antibiotic coverage, Nasogastric aspiration, prompt treatment of paralytic ileus by good electrolyte balance, good chest physiotherapy are all essential steps to reduce the complication rates to a minimum and the recurrence rates to nil.

ANNEXURE I

CONSENT FORM

TITLE OF PROJECT: A CLINICAL STUDY OF POST OPERATIVE COMPLICATIONS FOLLOWING REPAIR OF VENTRAL HERNIA USING MESH AMONGG PATIENTS ADMITTED IN COIMBATORE MEDICAL COLLEGE HOSPITAL

GUIDE: Prof. Dr.S.Natarajan.MS

P. G. STUDENT: Dr. Chandana Chandran

PURPOSE OF RESEARCH:

I have been informed that this study will analyze the immediate post operative complications following mesh repair of ventral hernia and also to identify the risk factors for the complications following mesh repair. This study will thus help the investigator better understand for the management of above condition.

PROCEDURE:

I am aware that in addition to the ordinary post operative care received, I will be examined and asked a series of questions by the investigator. I have been asked to undergo the necessary investigations, which would help the investigator as a part of routine management.

RISKS AND DISCOMFORTS:

I understand that I may experience some pain and discomfort during the examination or during my treatment. This is mainly the result of my condition and the procedures of this study are not expected to exaggerate these feelings, which are associated with the usual course of treatment.

BENEFITS:

I understand that my participation in the study will have no direct benefit to me other than potential benefit of the treatment.

CONFIDENTIALITY:

I understand the medical information produced by this study will become part of my hospital record and will be subject to the confidentiality. Information of sensitive personal nature will not be part of the medical record, but will be stored in the investigator's research file. If the data are used for publication in the medical literature or for teaching purpose, no names will be used and other identifiers, such as

photographs will be used only with my special written permission. I understand that I may see the photographs before giving the permission.

REQUEST FOR MORE INFORMATION:

I understand that I may ask more questions about the study at any time and Dr. Chandana Chandran at the department of Surgery is available to answer my questions or concerns. I understand that I will be informed of any significant new findings discovered during the course of the study, which might influence my continued participation. A copy of this consent form will be given to me to keep for careful reading.

REFUSAL OR WITHDRAWAL OF PARTICIPATION:

I understand that my participation is voluntary and that I may refuse to participate or may withdraw consent and discontinue participation in the study as any time without prejudice. I also understand that Dr. Chandana Chandran may terminate my participation in this study at any time after he has explained the reasons for doing so.

INJURY STATEMENT:

I understand that in the unlikely event of injury to me resulting directly from my participation in this study, if such injury were reported promptly then appropriate treatment would be available to me. But no further compensation would be provided by the hospital. I understand that by my agreement to participate in this study and not waiving any of my legal rights.

I confirm that Dr. Chandana Chandran has explained to me the purpose of the research, the study procedure that I will undergo and the possible risks and discomforts as well as benefits that I may experience in my own language. I have been explained all the above in detail in my own language and I understand the same. Therefore I agree to give my consent to participate as a subject in this research project.

_____ _____

(Participant) (Date)

_____ _____

(Witness to signature) (Date)

I have explained to _____the purpose of the research, the

procedures required and the possible risks and benefits to the best of my ability.

_____ _____

(Investigator) (Date)

ANNEXURE II

PROFORMA

Case No : IP / No :
Name: DateofAdmission:
Age / Sex : Date of operation
Socioeconomic status Date of discharge
Address
Occupation
Chief Complaints :

HISTORY OF PRESENTING COMPLAINTS :

1. Swelling: Site and duration
   - Size
   - Onset
   - Progress
   - Reducible / Irreducible
2. Vomitting – Duration
   - Frequency
   - Nature of vomitus
   - Relation to pain
   - Relation to food.
3. Abdominal pain duration:
   - Site
   - Nature of pain at the time of straining
   - Relation to food

4. History of strain – Chronic cough
   - Urinary complaints
   - Chronic constipation
5. Any other relevant complaints

PAST HISTORY

1. Trauma to anterior abdominal wall
   - Bullgore Injury
   - Stab Injury
2. Complications of previous operations
3. Incision and drainage of abscess of abdominal wall.
4. History of diabetes / Chronic obstructive pulomary disorder.
5. Wound Healing
   - Primary
   - Secondary

PERSONAL HISTORY

Diet
Sleep
Bowel / Bladder
Any Habits

MENSTRUAL AND OBSTETRIC HISTORY IN FEMALES

FAMILY HISTORY

GENERAL PHYSICAL EXAMINATION
General Survey
Patient's weight
Height
Obese (or) not

SYSTEMIC EXAMINATION
Cardiovascular system
Respiratory system
Central Nervous system
Per abdomen

LOCAL EXAMINATION
Inspection
Palpation
Percussion
Auscultation

RELEVANT SYSTEMIC EXAMINATION

INVESTIGATIONS
Complete Haemogram
Renal function test
Bleeding time, clotting time
Prothrombin time, activated partial thromboplastin time
Chest X-ray
Ultrasound – abdomen
Any other specific investigations
Diagnosis :
Date of surgery
Intra operative findings
Duration of surgery / type of anaesthesia.
Type of mesh used and position of mesh
Operative complications
Intra operative
Post operative early
Post operative late
TREATMENT FOR POST OPERATIVE COMPLICATIONS

ANNEXURE III
MASTER CHART

SL NO.	NAME	AGE/SEX	IP NO:	TYPE OF HERNIA	PRESENTING COMPLAINT	COMORBID CONDITIONS	PREVIOUS SURGERIES	EMERGENCY / ELECTIVE	TYPE OF INCISION	COMPLICATIONS IN PREVIOUS SURGERY	POST OPERATIVE COMPLICATIONS
1	Rajeswari	65/F	39712	EH	Sw, pain	COPD, BA					Skin necrosis
2	suseela	68/F	38557	IH	Sw	DM, HTN	Hysterectomy	Elective	Midline IU	Cough/COPD	Wound infection
3	Kamalam	59/F	41020	IH	Sw	DM	Hysterectomy	Elective	Transverse IU	Wound sepsis	Seroma
4	selvakumari	52/F	14360	PUH	Sw, Ir						
5	Sarasammal	60/F	41018	PUH	Sw	Obese, DM					Sinus formation
6	Pappa	31/F	71330	IH	Sw		LSCS	Emergency	Transverse IU	Wound sepsis	
7	Saraswathy	57/F	7086	IH	Sw, v	Obese, DM	hysterectomy	Elective	Transverse IU	Cough	GI complication
8	Parvathi	30/F	8029	EH	Sw						
9	Akila	52/F	14121	IH	Sw,pain		Tubectomy	Elective	Transverse IU		
10	Manju	45/F	22572	UH	Sw						
11	Banu	32/F	24422	IH	Sw	Obese	LSCS	Emergency	Transverse IU		Wound dehiscence
12	Fathimabeevi	50/F	35170	IH	Sw		LSCS	Emergency	Transverse IU		
13	Devika	45/F	46719	IH	Sw		Tubectomy	Elective	Transverse IU		Wound infection
14	Murugal	45/F	21273	IH	Sw		Port site	Elective		Wound sepsis	

15	Thenarasi	26/F	46689	IH	Sw	COPD	LSCS	Emergency	Transverse IU	Wound sepsis	
16	Mythili	40/F	70392	IH	Sw		LSCS	Emergency	TransverseIU		
17	Ramathal	60/F	75468	IH	Sw	DM,HTN	Laparotomy	Emergency		Cough/COPD, sepsis	Wound infection
18	Periyamma	72/F	348	EH	Sw	Constipation					
19	Rajeswari	46/F	72190	IH	Sw, Ir, v		LSCS	Emergency	Transverse IU	Wound sepsis	
20	Subbalakshmi	60/F	70595	UH	Sw,pain	DM, COPD/BA					Pulmonary infection
21	Mallika	47/F	69397	IH	Sw		Cholecystectomy	Elective	subcostal	Wound sepsis	Pulmonary infection
22	Saraswathy	41/F	66845	IH	Sw		Tubectomy	Elective	Transverse IU		
23	Santhamani	37/F	58918	EH	Sw						
24	Ponmani	50/F	57778	IH	Sw		Appendicectomy	Emergency	Mc Burney's		
25	Soniya	23/F	55573	IH	Sw	Obese	Port site	Elective		Wound sepsis	Seroma
26	Bindhu	31/F	54490	UH	Sw,Ir, v	Obese					Skin necrosis
27	Sankarammal	60/F	46544	EH	Sw,pain	DM					Haematoma
28	Saraswathi	55/F	42067	IH	Sw, v	Obese,COPD	Cholecystectomy	Elective	Subcostal	Cough/COPD, paralytic ileus	Wound infection
29	Selvi	32/F	41879	UH	Sw,pain	COPD/BA					Wound dehiscence
30	Subbalakshmi	39/F	40693	IH	Sw	Obese	Appendicectomy	Emergency	Mc Burney's	Wound sepsis, paralytic ileus	Seroma
31	Anthoniyammal	40/F	40636	UH	Sw,pain	Obese					
32	Kaveri	55/F	36033	IH	Sw	Constipation	Cholecystectomy	Elective	Subcostal	Paralytic ileus	GI complication
33	Fathima	52/F	25186	IH	Sw,Ir,v		Appendicectomy	Emergency	Mc Burney's		Wound dehiscence
34	sarojini	54/F	40641	PUH	Sw,pain	Obese					

35	Clara	37/F	37684	IH	Sw		LSCS	Emergency	Transverse IU		
36	Shanthi	26/F	37722	IH	Sw		LSCS	Emergency	TransverseIU	Wound sepsis	
37	Ratna	50/F	32114	EH	Sw						
38	Banu	22/F	18893	IH	Sw	Obese	LSCS	Emergency	Transverse IU	Wound sepsis	
39	Fathima beevi	37/F	24588	IH	Sw		LSCS	Emergency	Transverse IU	Wound sepsis	
40	Mani	52/F	18996	IH	Sw,pain		Hysterectomy	Elective	Midline IU	Cough, COPD	
41	Sivakami	50/F	6989	IH	Sw,pain	Obese, DM	Hysterectomy	Elective	Midline IU	Wound sepsis, COPD	Wound infection
42	Kanjana	27/F	47741	UH	Sw						
43	Thirumalai	50/M	75126	EH	Sw,pain						
44	Murugan	43/M	40881	PUH	Sw						
45	Ramasamy	48/M	27559	EH	Sw						
46	Sundaram	38/M	15769	PUH	Sw,pain	Obese					seroma
47	Raju	47/M	11182	PUH	Sw	COPD/BA					Wound dehiscence
48	Rajendran	50/M	38447	UH	Sw,Ir,v	Obese,BPH					
49	Sundaraj	50/M	38139	EH	Sw						
50	Rangasamy	50/M	23202	EH	Sw	Obese,HTN					

KEY TO MASTER CHART :

M-MALE, F-FEMALE, IH- Incisional hernia, UH-Umbilical Hernia, PUH- Paraumbilical Hernia, EH-Epigastric Hernia, Sw-Swelling, Ir- Irreducibility, V-Vomiting, DM- Diabetes Mellitus, COPD-Chronic Obstructive Pulmonary Disease, BA-Bronchial Asthma, BPH-Benign Prostatic Hypertrophy, HTN- Hypertension, IU- Infra Umbilical.

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